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Public Works DEPARTMENT.

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Proceedings of the Madras Government, Public Works Department,
27th January 1869.

No. 498. Read the following letter from the Chief Engineer for Irrigation, to the Secretary to Government, Public Works Department, dated 11th December 1868, No. 122:—

1. I have the honor to forward reports from the Superintending Engineers of Divisions on the results of surveys and investigations lately carried out in connection with Irrigation Projects in this Presidency, as called for by the Government in G. O., No. 1,824, dated 10th June 1868, and by the Government of India. Besides summarising these reports, I propose to furnish the Government with an account of the bearings of the projects which have been under inquiry, in connection with the present condition and the extension of irrigation in this Presidency.

Ganjam.

2. To commence at the Northern boundary:—In Ganjam, Captain Beckley, Royal Engineers, has recently been employed in examining the capabilities of the district for extended irrigation, and has had his attention engaged in devising means for utilising the supply of the principal river in the district, the Rooshkolia (drainage area 2,400 square miles); and a preliminary report has been submitted. The present condition of the irrigation in Ganjam is described as extremely defective. There are a great number of tanks, but, with two exceptions, they are of insignificant size, and though the rain-fall even in the worst years is believed to be sufficient for the wants of the district, if reservoirs were available to store even one month's supply, the loss of a portion of the crops is a common occurrence even in average years, and in bad years the whole crop is lost, and a famine is the result. While the smaller tanks are powerless to save the cultivation under them, the large tanks are perfectly efficient. Of the two specified by Captain Beckley, one yields a revenue of 15,000 Rupees, and no remissions have ever been made, and the other, which yields upwards of 10,000 Rupees, furnished a plentiful supply of water to the lands under it when the failure of crops elsewhere was so complete as to occasion a famine. "The general condition of the district must, I think be pronounced unhappy, and such as to demand amelioration. The prevailing custom of growing rice upon lands depending solely on the rains for irrigation must always be a source of anxiety to the people and to Government, and must produce famines periodically, perhaps the oftener now that high prices and other causes have given great impetus to the export grain trade; the soil is rich and fertile: there is little barren or stony land—the hills rising abruptly from the plains: the rain-fall is very large, though not excessive, and though variable, never appears to fail: all parts have short easy access to the sea; but, notwithstanding all these advantages, Kurnool and much of the Bellary District evince signs of far greater prosperity than Ganjam. Doubtless much of the squalor and wretchedness observable around is due to the apathetic character of the Ooriahs, and one great argument in favor of large Public Works is that through them the people would be trained to labor, and their indolence gradually overcome."

3. Captain Beckley suggests the construction of a series of large reservoirs, but in preference to dealing with them singly, he proposes to form them in connection with channels from the principal streams in the district. He proposes to construct a dam across the Rooshkolia to the west of Aska, and above the junction of its principal tribut[illegible] the Mahanuddy; to lead the supply of the latter by a

cross cut from a point above, the configuration of the country preventing his fixing his head works below the junction; and then to carry the combined supply from the two rivers by a cutting to the southward, between two ranges of hills, into the valley of the Shargaddah and Godahallow, (two other feeders of the Rooshkolia.) The plain country is then reached, and no obstacle would be experienced in carrying the channel onwards to the coast at Chetterpoor near Ganjam. It is further proposed to make the channel navigable, and to open out the section from Injelly to Ganjam in the first instance. Captain Beckley appears to have formed a favorable opinion of the scheme, as regards its remunerative results and its effect in improving the condition of the country, but the investigation cannot as yet be considered to have advanced to such a stage as will allow of Government forming any conclusions regarding it, especially as no definite information has been furnished concerning the water-supply of the Rooshkolia; but it may be surmised that the works projected will be of an exceptionally expensive character, partly in consequence of storage for water having to be provided in addition to an entirely new system of channels, and partly from the necessity of carrying the main channel through a heavy cutting in rock. I think it very desirable that the investigation should be continued, and that Captain Beckley should be furnished with such special establishment of Surveyors as he may require to work out the project thoroughly. Up to the date of Captain Beckley's last report, 160 miles of ground had been surveyed and levelled, and observations were being made of the rain-fall and the daily discharge of the Rooshkolia and Mahanuddy rivers.

Vizagapatam.

4. In Vizagapatam there are no important irrigation works, nor are any in contemplation. Both in this district and in Ganjam there are extensive Zemindary estates, and the management of the irrigation works is in the hands of the proprietors. On this account the field for improvement is of a limited character, especially in Vizagapatam, where the area of land under cultivation by the Government Ryots is only between 60,000 and 70,000 acres.

Godavery.

5. Godavery Delta.—The channels in this Delta, which were commenced in 1847, combine navigation with irrigation, and have been in operation for a number of years. The alignment may be considered tolerably complete, as it already embraces nearly the whole area of the Delta. The improvements that are required are mainly the simple enlargement of various channels, to admit of their carrying a further supply of water and of bringing fresh land under irrigation; but various other works of a miscellaneous kind are also necessary, especially as regards provision of outlets for the discharge of the cross drainage of the country which the channels intercept, and of the surplus water from the irrigated lands and from the channels themselves. Various locks on the larger channels, which were originally constructed on the most rigidly economical principles, and in not a very substantial manner, and which are now in bad order, will have to be replaced by larger, more commodious, and more efficient works. The fall of the bed on some of the channels, especially along such portions where the current is inconveniently high for navigation, has also to be rectified, and the subsidiary channels have to be extended and improved. Up to the end of 1866-67, the expenditure on the Godavery Delta works, exclusive of the charges [illegible] general establishment, has

mounted to the following sum :—

	RS.
New Works...	42,45,648
Repairs	34,17,029
Machinery ...	4,16,116
	80,78,793

6. A project for the formation of a considerable reservoir beyond the Delta imits has recently engaged the attention of the Superintending Engineer, Captain Ryves. The site is at the village of Unnoomoolunka. Fifteen square miles of country have been surveyed, and forty niles of contour levels carried out, from which it would appear that about 465 nillion cubic yards of water would be obtained on the supposition that the fall of ain is only 22½ inches. The bund would be eighty feet high and one and a half niles long, and the cost would be about twenty lacs. This project has not been vorked out in detail, and it would be premature to express an opinion upon it; but t is desirable that the investigation should be continued, since, as Captain Ryves emarks, besides its value as a source of supply for irrigation, the reservoir would be of great service in reducing the volume of the Yerrakalva floods, which have now o be passed across the Delta, between embankments, and which in seasons of xcessive rain-fall, *may* be productive of very serious injury to extensive tracts of rrigated lands.

Latitude 17° 2'
Longitude 81° 27'

7. The construction of an anicut across the Godavery at Polaveram, about wenty miles above Rajahmundry, was advocated many years ago by Sir A. Cotton, (I write from memory, and may be mistaken, as I have been unable to trace a eference to this project in any of Sir. A. Cotton's reports in my possession,) but the ubsidiary channels would necessarily be of a more expensive character than those n the Delta, and although the project is likely at some future period to merit atten- ion, it cannot be seriously thought of until the Delta system is fully completed.

Kistna.

8. Kistna Delta.—The works are similar in character to those in the Godavery, but having been commenced five years later, they are not so far advanced. The general scheme for completing the whole of the works has already been sub- nitted to Government, and sanction has been accorded to various projects, forming portions of the whole, which will occupy the establishment for a considerable period. The detailed plans and estimates for the remainder of the works are in a backward state, and at this moment are in abeyance, in consequence of the Super- ntending Engineer having expressed his inability to form a reliable estimate of he whole area of land which is likely to be brought within the influence of the hannels eventually.

9. The expenditure on the Kistna Delta works up to end of 1866-67 has been s follows, charges for general establishments not being included :—

	RS.
New Works...	27,35,196
Repairs...	11,05,832
Machinery	1,47,489
	39,88,517

10. In the Kistna District, but beyond the Delta limits, a project has been nder investigation for [illegible] the flood-water of the Moonyair, a considerable

river (drainage area 3,050 square miles), which passes through the Nizam's territories to within thirty miles of its junction with the Kistna. The project will have to comprise the formation of tanks for the storage of flood-water, and in that respect it will be more expensive than the majority of irrigation works which have been carried out by our Government.

11. A project for the restoration of an old native tank at Dondapad, in the south-west corner of the district, has also been partially investigated, and Government allotted funds in 1867 for the prosecution of this work and of another of a similar kind, but the preparation of the plans and estimates was not sufficiently advanced to warrant the Superintending Engineer commencing the work during that year, and since then the Officer who was employed on the investigation, (Captain C. J. Smith, Royal Engineers,) has been obliged to go Home on medical certificate. The drainage area is of limited extent, thirty square miles, and no very important results are to be anticipated from the work.

12. Both in the Godavery and Kistna Districts, the irrigation works out of the Delta limits though numerous, are individually unimportant. The country is undulating, and in some places hilly, and the works cannot be embraced under one or even under many separate systems : they must be treated in a great measure singly. A great deal of cotton is grown in the south-west portion of the Kistna ; the soil is also well adapted for dry cereal crops, especially for cholum or jowar. The tanks besides enabling the cultivators to raise a small quantity of rice, are also very valuable as reservoirs of drinking water for the people and their cattle. The Kistna itself has no influence beyond the Delta, as the country rises rapidly away from it. It carries an enormous body of water to the sea even in the worst years, and it would be quite possible, if an anicut were constructed about thirty miles above Bezwada, to lead the water to a much higher level than can be commanded by the existing channels. But such a project would be greatly more expensive than the Delta works, owing to the undulating and rocky character of the country, and it would be quite premature to take it up seriously, while the irrigation in the Delta is only half developed. This project was recently recommended for investigation by the Acting Collector of the Kistna District, Mr. Wilson, who is under the impression that the site he selected at Chintapully had not attracted the attention of the Engineers in the district ; but it will be seen on reference to the original report* on the Kistna anicut, that the river was fully explored, and that the site in question was rejected on account of the difficulty of dealing with the floods, which there attain a height of fifty or sixty feet above summer level.

G. O., No. 3,316, dated 20th October 1868.

* Professional papers, Madras Engineers, Vol. IV. p. 8, 9.

Nellore.

13. The Nellore District is traversed by one large river, the Pennair ; drainage basin 20,000 square miles. As far as Sungum on the north bank, and to near Nellore on the south, the country falls towards the river, but from these points towards the sea a considerable alluvial tract extends from the north and south banks of the river respectively. From Nellore, on the south bank, the Pennair water has been distributed by means of an anicut and a complete system of channels to the whole of the land which can be commanded in that direction, which may be considered as a parallelogram twenty miles long and twelve wide.

14. On the north bank the tract within the command of the river is already very richly provided with tanks, to some of which flood water has hitherto been led by means of imperfect channels of native execution. It is now proposed to form head works at Sungum, thirty miles from the sea: to lead all the ordinary flood water available in the Pennair, after the lower Delta works are provided for, by a capacious channel, into the Kanigeri tank, already one of the largest in the country: to enlarge its capacity, and that of another tank adjacent to it, so as to allow of their holding together about 340 millions of cubic yards; and to distribute the water from them not only to all the purely deltaic lands which are under command of them, but to a tract of country beyond. The area to be irrigated is computed at 80,000 acres. This project, which is estimated to cost between twenty and thirty lacs of Rupees, is now matured, and the preparation of the plans and estimates far advanced. I have every reason to believe that the project, which has been drawn up by Mr. R. Smith, Executive Engineer, will commend itself to the favorable consideration of both the Local Government and the Government of India.

15. The other rivers in Nellore, with the exception of the Soornamookhy, near the southern limit of the district, and the Gundulcumma, on the north, all rise in the Eastern Ghauts, which run nearly parallel to the sea, and at the distance from it of fifty or sixty miles. The floods brought down by them are of a spasmodic character; and as their supply is derived almost entirely from the north-east monsoon, which is not only of short duration, but of very uncertain character, there is no field for any extensive irrigation systems, besides those above noted, in this district; though doubtless a good deal may be done towards improving the flood channels leading to tanks, and the tanks themselves, some of which are already very fine works. The examination of the Soornamookhy (drainage area 1,174 square miles) will shortly be taken in hand. Improvements to the supply of various tanks under it have been contemplated for several years past, but, in consequence of the greater part of the land along the south bank being Zemindary, and of the Zemindar claiming certain rights with regard to the water-supply of the river, the local Officers have been deterred from taking up the subject, being hopeless either of coming to an amicable arrangement with the Zemindar, or of being able to establish a right to any specific proportion of the water in favor of the Government ryots. The longer any matter of this kind is left unsettled, the more difficult it is to arrive at any result, and I would, therefore, propose to have the river examined as soon as a Surveyor can be set free from the Sungum project. The Gundulcumma (drainage area 3,100 square miles) is a considerable river, but the supply from the most important part of its basin is already absorbed by the great Cummum tank, and from thence onwards to the sea the channel is an unfavorable subject for artificial appliances, on account of its very considerable depth and the heavy expense which would in consequence have to be incurred to lead the water in low freshes to the surface of the ground.

16. The Kundalairoo, which passes close to Gudur, twenty miles south of Nellore, has a drainage basin of 1,240 square miles. There is already a well built native anicut across it, and a channel feeding Gudur tank. Another channel from a branch of the same river to the Chennur tank is in progress, but the resources of the

river cannot yet be said to be fully utilised, and it is desirable that they should form the subject of further investigation.

Bellary.
Cuddapah.
Kurnool.

17. Turning to Bellary, Cuddapah, and Kurnool, it will be seen, on reference to the Map, that the Toongabudra runs along the northern boundary of Bellary, and that, at a short distance below Kurnool, it is joined by the Kistna; also that all the other rivers in these districts derive their supply from what may be termed local drainage. The Huggry, a branch of the Toongabudra, is an exception, but, though it comes from a distant part of the Mysore country partially within the influence of the south-west monsoon, its supply, owing to local circumstances, is scanty and uncertain, and it is consequently a very poor river as regards its power of irrigation. On the Toongabudra there are several anicuts and channels, and as that river derives its unfailing supply from the Western Ghauts, in which there is an abundant fall of rain, the cultivation under them is secure, and of course very valuable to the small section of the district to which their influence extends, when other sources of supply fail. But they are small works, and do not offer any great field for improvement, to say nothing of the claim which the Madras Irrigation and Canal Company have on any of the Toongabudra water which is not yet utilised. It is on the Huggry that the Mauri-Convai works are contemplated by the Mysore Government, and, if they are carried out, of course even less water than before will reach the Bellary District. But it is hoped that, with the aid of various branches which will be unaffected by this scheme, there will be enough water left to supplement the supply of several considerable tanks. A project with that end in view has been under investigation, and may shortly be expected. The other rivers in the three districts above named are nearly all in the Pennair basin. It will be observed that the Chittravutty, the largest of its branches, and also most of the smaller branches, have been dammed across to form tanks, and some of these works are not only extensive, but exhibit a boldness of design which is worthy of high admiration. With extraordinary natural disadvantages to contend against, the old native rulers have indeed done so much, that the difficulty now is not, from a number of promising projects, to select the best, but to find any projects which are worthy of consideration at all. The Irrigation Company have already secured a right to the Toongabudra, but were it otherwise, the feasibility in an economical point of view of further utilising its water for irrigation from any point higher up than Kumply is made more than doubtful by the extremely uneven and rocky character of the country skirting its course. The other rivers have an uncertain supply, and though they are no doubt useful, in ordinary seasons, for the better supply of the tanks connected with them, it would be puerile to look to them as a safeguard against famines, for if the local rains fail, they fail also. The only projects which have yet come forward, and which are likely to turn out well, are two anicuts and sets of channels on the Pennair, at the distances of from thirty to fifty miles from its source. In the locality in question, there are already a series of tanks, some of which derive a partial supply from the Pennair by means of temporary dams across it, and small channels from it. The proposed works will, no doubt, place the supply on a better footing; and, though it may be difficult to prove that they will secure a return exceeding five per cent. on the outlay, it is possible that that standard may be reached. Another project on a larger scale, and which is nearly matured, has been designed

with a view to supplementing the supply of the Anantapoor and Bookacherla tanks by means of a channel from the Pennair, which would be led off shortly below the terminus of the other new channels above described, but these tanks are not in the valley of the Pennair, and the cutting through the water-shed would be of a very expensive character. This might not be an insuperable objection if an abundant supply of water could be counted on, but the reverse is the case. The project is one of those which have been frequently pressed on the attention of Government by the Revenue Officers of the district and by the Revenue Board. Plans and estimates for carrying it out were fully considered by Government in 1864, but were not approved, as they did not appear to be based upon sound calculations of the cost of overcoming the natural difficulties of the country. They were consequently returned for revision, and this having lately been accomplished, the result is, I fear, that the project will have to be condemned. A project is also under investigation in Cuddapah District for improving the supply of two large tanks, but it is not yet matured.

18. As in Nellore and other districts, numerous improvements may be made to the existing tanks. Many of them have silted up to such an extent as materially to impair their efficiency; and the attention of the Officers of the department may be usefully occupied in restoring the capacity where possible by raising the embankments, when this can be advantageously done without submerging valuable land, or without incurring too great an outlay. No one project of this nature can merit the special attention of the Government of India; but a number of well devised improvements, which may individually appear insignificant, are what such districts as Bellary, Cuddapah, and Kurnool, and indeed most of the other districts in the Presidency as well, want; for it is by means of them that the existing sources of supply can be utilised to the full extent, while the introduction of a supply from extraneous sources is beyond the power of any works, however great.

North-Arcot.
Madras.

19. Turning now to North Arcot and Madras, I have to explain that various improvements are in contemplation. The Government of India have already sanctioned the enlargement of the Red Hill and Cholaveram tanks, which derive their supply from the Cortilliar river, after it is joined by an important branch from the north-west; and also of the Chembrambaukum tank, which lies between the Cortilliar and the Palar river. These works, which are both in the vicinity of Madras, are now in progress, but the supply of the latter tank is dependent to some extent on that of other tanks, which cannot yet be considered to be on a satisfactory footing.

20. The Palar Anicut, and the channels leading from it, were designed with a view to improve the supply of nearly all the tanks—which are very numerous—situated between that river and the Cortilliar, as well as others to the north of the latter, but a very mistaken estimate was formed of the capabilities of the Palar, which, it was supposed, was in fresh for thirty-five days in the year on the average, whereas in reality, in some years, it does not come in fresh at all.

21. Very exaggerated views of the capabilities for sustaining extensive systems of irrigation of the rivers on the Eastern Coast of this Presidency have been entertained by the public, and have been persistently urged on the notice of

Government. Even the Commissioners appointed to enquire into the Public Works system in the Madras Presidency would have led the readers of their report* to the conclusion that the superiority of Tanjore over the districts adjacent to Madras was to be ascribed mainly only to one cause, viz., that capital to a vast amount had been invested in it, in bringing water to the fields, while they lost sight of the fact that Tanjore has extraordinary natural advantages, in possessing a deltaic tract of country traversed by a number of arms of the Cauvery, and that, moreover, no amount of capital expended in attempting to bring water to the fields in North Arcot or Madras could place these districts on the same footing with Tanjore, unless the source from which that water was to be drawn could in the first instance have been made as abundant and as unfailing as the Cauvery. It now appears that the Palar works do not answer the expectations that were formed of them, nor is it likely, when the project was drawn up, which was at a time when Officers had the greatest difficulty in obtaining money for any large works, that either they or the Government would have ventured to propose anything, had they foreseen that to secure a supply from the uncertain freshes of the Palar, a much higher scale of expenditure than had been customary on any other class of Irrigation works in the Presidency would prove to be necessary, and that the supply of that river was both so defective and so uncertain as it has proved to be. But on the other hand, it has now to be argued, that imperfect though the supply of the Palar is, it is the only one, besides local rains, which can be made available for filling a number of tanks, many of which are of considerable size and importance: that the remunerative effect of Irrigation works is not the only aspect under which they are to be regarded; and that if Government derive an exceptionally high rate of profit from one system of works like those in the Deltas, they ought to be prepared to make a corresponding sacrifice to bring up works less favorably situated to the highest standard of efficiency.

* Paragraph 284.

22. It must stand to reason, that it must be more difficult and expensive to draw a supply for a given area from a river which may be in fresh for ten days in the year, than it would be if the freshes lasted for sixty days or more, as is the case even with the Pennair at Nellore, and that, as there are tanks in the Pennair Delta, as well as in the country affected by the Palar, it must be a much more costly and less remunerative undertaking to distribute water from the latter than the former; and the disproportion of cost must be still greater if the Palar is compared with the Cauvery, or the Godavery, or Kistna Deltas, where the aid of tanks is unnecessary. Besides which, the country through which a channel from the Palar has to be carried, instead of being alluvial and possessing a fall suitable for the conveyance of water, is undulating and irregular, and the soil in many places is hard and even rocky. These disadvantages have stood in the way of the Palar works having been taken up in a comprehensive manner.

23. The channels, so far as they are carried out, are, I believe, in the right direction, but they cannot be considered as in any way complete. They have to be greatly enlarged before the tanks at a distance from the head can be supplied by them, and numerous masonry works are required to regulate the fall. The expense must necessarily be great, as above explained; but unless the tanks are to

be left to the natural supply from local drainage, it will have to be incurred. One thing should never be lost sight of, viz., that our native predecessors have constructed the tanks for us; and that the cost of improving the means of irrigation to the part of the Presidency under consideration must be immeasurably below what an entirely new system of works would have proved.

24. The above remarks on the Palar are applicable also to the Cheyaur, and in a somewhat less degree also to the Poiney: these, with the Palar, being the three streams from which such improvement of irrigation, as is compatible with the condition of a limited command of water, is expected to be derived. The Poiney, though only a branch of the Palar, is better situated, from the direction in which it takes its rise, to receive a good supply, and the anicut which was constructed on it some years ago, with the channels under it, have, in consequence, proved more useful than the similar works on the other two rivers, although they have not come up to what was expected of them. There is already an anicut and a system of channels from it on the Cheyaur, and two other projects connected with the same river have formed the subject of investigation during the past season. The existing project is not yet complete, and the surveys of the others have only been advanced to a stage which will enable a skilful Officer to use them as a basis for a general design of the works. I say skilful, for the alignment of channels through an undulating country, coupled with the necessity of providing for the supply of an enormous number of tanks of various sizes, must necessarily be an intricate and difficult operation. The object and scope of the projects connected with the Palar and Cheyaur rivers, which have been under investigation, are fully explained in the report by Colonel Boileau, Superintending Engineer, 4th Division. Two minor projects are also particularised by the Superintending Engineer, but I have not yet had the means of forming an opinion of their value. It is also designed to examine the north banks of the Cortilliar, and the Arnee or Nurnaveram river (drainage area 500 square miles) which runs a few miles further north, and which traverses a tract which is well provided with tanks. Indeed, the surface of nearly the whole of the North Arcot and Madras Districts is covered with a perfect net work of tanks. Some of these admit of enlargement, others may be connected with rivers, and have their supply more or less improved; and though the irrigation in both districts must always be attended with uncertainty, the Government should, I think, take it upon themselves to undertake that the supply of water available in *average years* at all events should be utilised, even if the works required to effect this object do not promise to be sufficiently remunerative to entitle them to a grant from the "Loan" Fund.

South-Arcot.

25. South Arcot is already well provided with the means of irrigation. A number of small but useful works have been carried out by the present Superintending Engineer, Colonel Foord, who has been connected with the district for the last twenty years, and two other projects, estimated to cost 54,800 and 11,000 Rupees respectively, have lately been submitted by him, and have received the sanction of Government. The smaller class of rivers which traverse this district are better supplied than the Palar, while the southern portion of the district is bounded by the Cauvery, and derives a supply from it by a channel leading from the lower anicut.

26. The Superintending Engineer is of opinion that there is no field left for works of the larger class, but that various improvements, of which he mentions several, may be superadded to the existing supply channels of tanks. The improvements which have either been carried out, or which are in contemplation, may all be said to be of the same character. Small channels have in times past been led off from the river to various tanks, and in freshes the water is turned into them, in some cases by means of permanent dams, in others by banks of sand and brushwood. The old channels are imperfect works, and the tanks furthest from the head get an insufficient supply. The revenue of course suffers in proportion. The new works almost invariably comprise the construction of a masonry weir or anicut across the supplying stream, and of head sluices for the regulation of the supply. The old channels are either abandoned altogether, or modified both as regards their sectional area and their levels, and distribution sluices are built for giving a proper share to the different tanks. It cannot be affirmed that the distribution is in all cases perfect, or that there is not room for further improvement in some of the works which have been executed under this Government, but, judging by results, the small projects which have been carried out in South Arcot may be looked upon as pattern works of their class. It need not be supposed that the very high returns which are quoted from some of them are exaggerations. The storage room for the water had already been provided by the natives; the defects of the channels as regards its supply and alignment and the distribution of water, had to be remedied before the people could get a proper supply for their fields; but these defects once removed by the judicious outlay of a moderate sum of money, the cultivation and revenue rise to the *maximum* of former years, or it may be beyond it, and, compared with the average revenue, this rise may be enormous, and indeed appear incredible to any one who has not the opportunity of scrutinizing and verifying the returns. For example, it is hard to believe that an expenditure of between 11,000 and 12,000 Rupees on the Trivady Anicut, in South Arcot, yields an annual return of 30,000 Rupees. Of course, the more promising projects of this class are taken up in the first instance, a less paying series has then to be fallen back on, and, finally, we arrive at a stage when the improvements required may be of so expensive a character, that the results accomplished though they may be very beneficial to the country, may not be highly remunerative to Government.

Salem.

27. In Salem, with the exception of tank improvements and the extension of irrigation from the Cauvery, no projects are likely to be brought forward. The Superintending Engineer mentions one which is now under investigation and which is estimated to cost 59,600 Rupees. The formation of a large tank across the Pennair, near Kistnagherry, was suggested by the late Sub-Collector Mr. Thomas, and an Officer has lately been deputed to survey the site. Several other projects have been proposed for examination by the Revenue Officers.

Coimbatore.

28. The Cauvery forms the southern boundary of the Salem District and the northern boundary of Coimbatore. A project has been drawn up for the construction of an anicut across the river, at the distance of about twenty-eight miles from Erode, and for channels leading from the north and south flanks. The length of

each in a direct line would be about twenty-five miles, though their actual course will be considerably more. An ancient rough stone anicut, a remarkable work of its kind, crosses the Cauvery at Nerinjepett* and its restoration had long been advocated by the Revenue and Engineer Officers of the Salem District, but, prior to the year 1855, no detailed professional examination of the work, with a view to the preparation of a definite project in connection with it, had been made. In that year an estimate for restoring it and for a channel for the north bank was drawn up by Lieutenant (now Colonel) C. V. Wilkieson, but it was not sanctioned. The subject has been investigated afresh during the past season; and, with a view to gain a better command of the country, a site for a new anicut has been selected about four miles higher up the river than the old one. The ground to be traversed by the channels is very irregular, and is intersected by numerous drainages, which will necessitate the construction of a corresponding number of aqueducts and escapes. The project will thus be of an expensive character, but as a certain supply can be counted on from the Cauvery for the estimated acreage (about 20,000 acres, one crop only) without, it is believed, producing any injurious influence on the extensive irrigation in Tanjore, it is anticipated that the estimates will meet with favorable consideration. They are now nearly ready for submission.

* Poolumpett in the Trigonometrical map.

29. The Calingaroyen channel, which is fed by the Bowany river, and which runs with an extremely tortuous course fifty-five miles in length, but in a general direction nearly parallel to the Cauvery, and at a mean distance of about half a mile from the south bank, has also been engaging attention. The anicut across the river, and the channel itself, are of purely native formation, the head sluice and several masonry works constituting nearly all the improvements it has received under European management. The levels of the channel and the distribution of water are extremely defective, the water being led to the fields by means of cuts in the banks, to the number of about 2,000.

30. Large estimates were submitted for sluices in 1855 and other works, but funds were not available. This channel and others of a similar character under the Bowany, the aggregate revenue of which is about 2,00,000 Rupees, are being placed in the separate charge of an Officer, who, after surveying them, will prepare the necessary plans and estimates for the various improvements which are required to place the irrigation on a satisfactory footing.

31. There are numerous other channels in the Coimbatore District, chiefly under the Amravutty and Noyel rivers, with an assessment of about two lacs of Rupees. I cannot at present speak with any confidence as to what extent they are capable of improvement, but it can hardly be doubted that the present arrangements for the distribution of the water are defective, and that some of the channels which are now supplied by means of temporary dams, or Corumboos, would be benefited by the construction of masonry weirs across the supplying streams. On the Amravutty, there are twenty-two separate channels, of which six are supplied by the aid of temporary dams, and on the Noyel river there are twenty-four channels, all supplied by means of anicuts. Colonel Ludlow wrote as follows, in 1854, on the subject of these works :—"The Amravutty drains an area of upwards of 3,000 square miles,* including the northern slopes of the Dallee or Palaney range of hills and is

* 3,500 square miles.

partially affected by the south-west monsoon. For a considerable portion of the year, therefore, it has a fair supply, and at times a very large one, but at the latter end of the season this frequently fails, and the crops suffer much in consequence, and the necessity arises for large remissions in the worst cases."

Average loss by remissions about 20,000 Rupees per annum.

"The area of drainage of the Noyel river (1,340 square miles) is much more circumscribed than that of the Amravutty, and owing to the confined extent and eastern aspect of Bolumputty valley, on which it has its source, the supply is anything but abundant." From Fuslies 1244 to 1260 (inclusive) the average annual assessment was Rupees 1,38,694, the settlement only 66,197, the per-centage of loss on the ayacut being fifty-two, or rather more than half.

32. Mr. W. Fraser, C. E., was occupied several years ago in drawing up projects for the formation of extensive reservoirs, on the branches of the Cauvery which drain the Neilgherry Hills, but the plans and estimates have not yet been submitted. I learn, however, that the designs for the most important of the proposed reservoirs will be sent in without further delay. A minor reservoir project was drawn up by Major Farewell, under the direction of the Superintending Engineer, 7th Division, Colonel Walker, and the prosecution of the work has been entrusted to Mr. McIvor, Superintendent of Government Chinchona Plantations, who has engaged to raise a bund to the height of 140 feet and to furnish the necessary appliances for disposing of the flood water for the sum of 25,000 Rupees.

G. O., No. 2,271, dated 16th July 1868.

Tanjore and Trichinopoly.

33. In Tanjore and Trichinopoly the field for improvement is of a limited character. It has indeed been proposed to restore the old Ponnairy tank, which was formerly fed by the channels from the Coleroon and Vellaur, and it is very desirable that an investigation into the economical practicability of the undertaking should be carried out, when an Officer can be spared for the purpose; but the attention of the Officers of the Department, in these districts, will mainly have to be occupied in perfecting the existing system of irrigation under the Cauvery and Coleroon. In the Trichinopoly District there are several old channels, which may be considered as in a great measure independent of the great system under the Upper Anicut. They are of a similar character to the Calingaroyen channel, above described, and it is probable that the arrangements for the distribution of the water are capable of considerable improvement, and that it will be found advantageous to place an Officer in exclusive charge of them.

34. In Tanjore, the regulation of the Cauvery and its numerous important branches, or rather arms, is now engaging attention. The necessity of dividing the supply among the various channels, in proportion to the cultivation under them, has long been recognized by the Engineers of the district, though, from the inability of the Government to provide the requisite funds, it is only recently that a project for carrying this important operation into effect has assumed a definite shape. As the Government are aware, Captain Mead has been engaged for a considerable time in carrying out the necessary preliminary surveys and investigations, which, owing to the enormous size of the rivers to be dealt with (the Cauvery for

some distance from its head at the upper anicut being fully a mile wide), the total absence of reliable records of the cultivation under each river, and of levels showing the state of the channels at different periods, have necessarily been of a very laborious and intricate character. Captain Mead's first report has already been before Government, and the construction of regulating dams across the Cauvery at the heads of three large arms, the Codamoorty, the Arasalar, and the Veerasholen, and across the heads of the arms themselves, has been decided on. Plans and estimates may shortly be expected for the works which are still required for the control of the Cauvery itself. They are designed with the two-fold object of shutting off dangerously high floods from the Delta, and of effecting a fair apportionment of the ordinary supply between the Cauvery and the Vennaur, the cultivation under each of which is about 350,000 acres. It is not considered safe to discharge into the Coleroon beyond a limited supply of the surplus flood water, and as, moreover, a large quantity of water is required at times in the Delta, to make up for the deficiency below the ordinary standard at other times,—a contingency very liable to occur in consequence of the fluctuating character of the freshes,—the regulating works have to be designed on a scale far more extensive than any work of the kind that has been undertaken in this country.

35. The Superintending Engineer, Captain Oakes, does not anticipate that any great increase of cultivation, and, therefore, of revenue, will result from the improvement of the deltaic rivers, but he explains that the supply of the lands will be better regulated, and, therefore, more constant in seasons when the monsoon is not very favourable; and that the waters during floods being more fairly distributed, according to the capacity of discharge of the various rivers, will do less injury than they now do; and that a large saving in temporary repairs and in closing breaches will in consequence be effected.

G. O., No. 1,783, dated 6th June 1866.

36. The regulation of the Cauvery and the larger streams in Tanjore once effected, the next step will be to improve the system of distributing the water to the smaller channels, or rather to institute a system, for at present there is none. It will be a task that will not be willingly taken up by many Officers in the Department, as, independently of various engineering difficulties in their way arising from the variable character of the supply of water, they will meet with great opposition from the influential cultivators, who would not only present hundreds of petitions against the introduction of the new works, but would take more active measures to check them by bringing actions against the Superintending Engineer in the Law Courts. This is no imaginary evil as the Government are well aware. That some day or other it will be necessary to put a stop to it by legislation if any real improvement on the old native systems of irrigation is considered essential, I feel perfectly satisfied; and, indeed, without legislation to support the Public Works Officers in Tanjore, it will be useless, as has been already brought to notice on several occasions, for them to attempt to introduce any real improvement in the present defective style of distributing the waters of the Cauvery.

Madura.

37. In the Madura District, the existing supply of water is already fully utilised. There are numerous small channels from the Vigay and the minor streams in the district, but they are far from sufficient for the wants of the people. The

importance of the Perryaur scheme, which was recently under the consideration of Government, and which would throw an abundant supply from an entirely new source into the most arid part of the district can hardly be over-estimated. The project has been investigated by Captain Payne and Captain Ryves, the latter Officer being the originator of the scheme, and a report has been submitted explaining the nature and object of the proposed works. Some delay occurred in following up the investigation in consequence of the demand for Officers in other directions, but two Officers have lately been appointed to open out roads, and to make the further preliminary investigations which are required, preparatory to the submission of the estimates for the approval of the Government of India. In briefly describing the nature of the project, I can only recapitulate what has been stated on other occasions. It is to turn the supply of the Perryaur, a river which drains an area of 250 square miles of hilly country within the influence of the south-west monsoon, over the edge of the ghauts, which overlook the plains of Madura. The bed of the river is about 165 feet lower than the lowest point in the ghaut, at the spot selected for the diversion, and at the distance of about four miles from it. It is proposed to raise the surface of the water to the height of about 150 feet above its lowest level, and to cut through the saddle to a maximum depth of forty feet. The site for the embankment is favorable as regards the formation of the ground, and the quality of the soil is also well suited for the construction of a water-tight embankment, but the locality has the reputation of being extremely unhealthy during the hot weather (15th February to 15th June,)—that is at the time of the year when the progress of the work would be least liable to interruption from floods,—and the ground is covered with dense jungle. The cutting through the saddle would be mainly in rock, and Captain Ryves has carefully considered the relative cost and difficulty of the embankment and cutting with various alternative heights and depths respectively, before coming to a conclusion that the preference should be given to those which provide for the formation of a reservoir 150 feet deep. Further enquiry may possibly lead to a modification of this arrangement, but not to any extent. The project is a noble one, and though there are formidable difficulties in the way of its execution, it is hoped that by perseverance and good management it will eventually prove successful. The sanction of the Government of India to the large outlay it will involve cannot of course be expected, until the complete feasibility of the undertaking is established; and it is with that object in view that the two Officers above adverted to, have been deputed to open out roads in the vicinity of the proposed works, and by thus attracting labor on a small scale and accustoming the people to frequent a tract of country at present shunned by them, to allow of a judgment being formed as to how far the contemplated operations on a larger scale are practicable.

38. An ancient lake on the Pulney hills attracted the attention of His Excellency the Governor during his recent visit to Madura, and a rough survey by the Superintending Engineer shows that if it were restored it would be capable of holding a supply of water equal to the irrigation of 8,000 acres. The ground in the vicinity, which is 7,000 feet high above the sea, is described as being admirably adapted for a Hill station.

Tinnevelly.

39. In Tinnevelly a project for utilising the surplus water of the Tambrapoorni river has been drawn up, and the estimates have lately been submitted for ap-

proval to the Government of India. This river, though of insignificant length, derives a plentiful supply from the south west monsoon, which breaks with full force on the ghauts, in which the river takes its rise. The irrigation under the river is very important. It is carried on by the aid of a succession of anicuts (seven in number) and channels, all of native workmanship. These old works have been maintained at a trifling cost to Government, and yield a revenue of about six lacs of Rupees. The project recently submitted provides for the irrigation of a strip of country to the north and south of the river, from the terminus of the existing channels to the sea. The northern channel, which ends at Tuticorin, will be twenty-six miles long, and the southern channel to Tritchendoor twenty-two miles. The area to be irrigated is estimated at 32,500 acres, and the returns Rupees 1,43,000 on the estimated outlay of about eight and half lacs of Rupees.

40. The improvement of the irrigation under the minor streams in Tinnevelly will also merit attention.

41. I have now in a manner described the condition and prospects of the irrigation in every district in the Presidency excepting Malabar and South Canara, which, in consequence of the abundant supply of water they receive from the south-west monsoon, do not require to be noticed. A few general remarks may be added with advantage.

42. The Government of India will perhaps be disappointed to learn that the improvements which are in contemplation in this Presidency are of a limited and even insignificant character, compared with the great projects which are coming before them from other provinces. But the fact is, that in no other part of India had so much been done for the development of the resources of the country by the old native rulers. The further South one goes, and the further the old Hindoo polity was removed from the disturbing influence of foreign conquest, the more complete and elaborate was the system of agriculture, and the irrigation works connected with it. The execution of such works appears to have been considered a religious duty by the people. Not only has almost every available source of supply, within their power of mastering, been utilised to a very great degree, but in many instances they even carried out the works far in advance of the supply. The vast system of tanks which cover the face of the country, and which represent an almost incalculable expenditure of labor, have very generally been constructed not only to provide for the storage of the ordinary rain-fall, but also that of exceptionally favorable years. Not only, too, were all favorable sites for the construction of tanks eagerly sought for and turned to the best account, but unfavorable sites also, where success was only to be attained by the display of very considerable constructive skill, and by the most profuse outlay of money and labor, or at least of labor. The Natives thus constructed numerous tanks with embankments three or four miles long, and thirty to fifty feet high, and revetted on one or both sides with rough stone; with sluices for the distribution of water, and with escapes for the discharge of exceptional floods, some of them of great length and of massive construction. Their sluices are remarkably well adapted for the distribution of the water under a variable head, and are, moreover, eminently calculated to prevent the occurrence of accidents from the careless and imperfect management under which they must generally be placed. So anxious were the Natives to avail themselves to the utmost of all available sources of supply, that they con-

structed many tanks in situations where it was impossible that a proper supply of water should reach them; and it is now common to meet with works of the kind which at a later period have been purposely allowed to fall into decay. Other tanks have also been rendered useless by becoming silted up. The process though very generally a slow one, is nevertheless sure, and of course in cases in which the drainage water has, before reaching the tank, to pass over a tract of alluvial or other soil which will yield easily to the action of a current, the deterioration may be rapid. In such cases it is a mere question of time, for the soil which is thus distributed over the bed of a tank, to become more valuable for the cultivation of dry crops, than the ground outside, with a diminished supply, for the cultivation of rice. I lately saw a tank, near the head of the Pennair, a short distance to the north of Nundydroog, which had evidently been abandoned from this cause, the old bed having become raised about twenty feet above the level of the ground outside. Many instances might be given of tanks having been given up either from the same cause, or from the totally inadequate supply of water they received for the irrigation of the lands under them. Of course there are cases where tanks may have given way from neglect, or from their not being provided with proper means for the discharge of surplus water in heavy floods, but the cases in which they have purposely been allowed to go to ruin are, I believe, more numerous, although, from the works having been abandoned many years ago, the cause may not have been within the cognizance of the present generation. Projects for the restoration of old tanks must therefore be received with caution. It by no means follows that because an old tank bund may have been built on a large scale, and because comparatively little labor and expense are required to restore it, its restoration may be a judicious proceeding. In many cases it would certainly be the reverse.

43. The Natives also carried direct irrigation by means of river channels, or by channels and tanks combined, to a tolerably high degree of perfection. There is the Cauvery system in Tanjore, which is the completest thing of the kind in India, and the Tambrapoorny system in Tinnevelly, which, though on a much smaller scale, exhibits, with regard to the anicuts across the river at the heads of the various channels, very considerable constructive skill. There are numerous works of a similar character on the Toongaboodra in Bellary, the Cauvery and its branches, and on nearly all the minor streams in the Presidency. With regard to the alignment of channels, the natives having only the means of judging of levels where they could see water actually running or standing, failed when they ventured to enter irregular ground. They could not go far wrong as long as they kept parallel to a river, but if a ridge or a succession of ridges had to be cut through they got into difficulties. Consequently there are many old channels which have been abandoned either because the difficulty of conveying the supply to the required point turned out to be more formidable than had been anticipated, or because the point of delivery may have been on an impracticably high level. On the whole, the native channels are an inferior class of work to their tanks. The distribution of water, though probably arranged originally on tolerably fair principles, is every where under the old channels of the most defective kind; but until definite proposals for rectifying existing abuses can be brought forward, it is useless to enlarge on this point.

44. It will be seen from the above remarks that the Natives had made great advances towards the attainment of a complete system of irrigation throughout

this Presidency. But though many of their works exhibit considerable boldness of design, and no small degree of constructive excellence, they failed in mastering the largest class of rivers, where no foundation but sand was to be found for the construction of masonry dams. Thus it required the aid of British Engineers to construct anicuts across the Cauvery in Trichinopoly and Tanjore, and across various other rivers in the low county bordering on the eastern coast. Once they were finished, but two great works remained to be done. I refer to the construction of dams across the Godavery and Kistna at the heads of the deltas of those rivers, and to the opening out of a system of channels from them. The Natives had altogether failed to place the irrigation of the rich lands in the deltas on anything like a secure footing. They had indeed excavated a number of channels, and in the Kistna tanks had also been formed, but in consequence of the great variation in the surface level of the rivers, and the impossibility of conveying the water to the surface of the country during low stages of the supply, the cultivation was of the most precarious kind, and the districts would be suffering from famine when an abundant supply of water for the irrigation of the whole area was running uselessly into the sea. The anicuts at Dowlaishweram and Bezwada, with their subsidiary channels, have changed all this; but the irrigation of a district cannot be perfected in a single generation, and the completion of the works, with the introduction of improvements in the very imperfect mode of cultivation now prevailing in these districts is, beyond all comparison, the most important work that remains to be carried out in this Presidency.

45. Smaller works have been executed with good effect in Nellore, others are in contemplation there, and various projects are also under consideration for the improvement of irrigation in other parts of the Presidency, as I have explained in the body of this report; but they are all of an insignificant character compared with the works in the Godavery and Kistna Deltas. Nothing at all to be compared with them is likely to be brought forward. Every deltaic tract of country of considerable size is now taken up. There are only two rivers, the Cauvery and Toongaboodra, which derive a supply from the south-west monsoon, and which pass through any considerable extent of non-deltaic country within the limits of this Presidency. In consequence of that supply being the only one which is of so unfailing a character, as to constitute a source for any great extension of irrigation any large future projects must be limited to those rivers.* But owing to the hilly character of the country bordering on the Cauvery from its source to the eastern boundary of the Mysore territory, and some distance beyond, no extensive works are to be looked for from it; and, as regards the Toongaboodra, the supply, which moreover is far less regular than that of the Godavery and Kistna at the heads of the Deltas, has been placed at the disposal of the Irrigation Company,—with what result the Government are aware.

* Unless we include the possible opening out of a second system of channels from the Godavery and Kistna, from Polarum and Chintapully—*vide supra* para 7 and 12.

46. The most important new projects under consideration at present are the Perryaur scheme in Madura, the Sungum project in Nellore, and the Rooskolia project in Ganjam. Any others which may be brought forward are likely to be of secondary importance. The improvements to existing works, which will from time

to time be proposed, will however be very numerous. They will embrace the regulation of the Cauvery and its branches in Tanjore, the construction of head sluices to the Tambraporney channels and the rectification of defects of alignment and in the distribution of water from them as well as from various other old channels. Tanks also will in many cases admit of improvement. But with few exceptions such improvements, though important as a whole, and though they will involve a considerable outlay, will not individually merit the attention of the Government of India.

From the Superintending Engineer, 1st Division, to the Chief Engineer for Irrigation, dated Dowlaishweram, 3rd November 1868, No. 150.

1. I have the honor to submit the Report of results of Survey operations for Irrigation Projects called for in G. O., No. 1,824, dated 10th June 1868, and in your No. 78, dated 17th instant.

2. GODAVERY.—With the exception of a survey and contour levels of the proposed site for a reservoir to store the flood waters of the Yerrakalwa, our survey operations in the Godavery District have been confined to the Delta.

3. JUMUMALUNKA TANK PROJECT.—For the reservoir the work done was only some fifteen square-miles of survey and about forty miles of contour levels. The latter appear to show that a bund 7,900 feet long at top, raised to eighty feet above the bed of the Yerrakalwa, would store 270 millions cubic yards between the thirty* and sixty* feet levels.

* Above bed of Yerrakalwa.

4. In a bad season (say fifteen inches of rain brought by the south-west monsoon and half that quantity by the north-east monsoon) a tank, of the above dimensions established at that site, would supply about 465 millions cubic yards of water *for irrigation*,† which, if used, and paid for at the established rate, would give an income of three and a half lacs of Rupees per annum, and as the cost of the work would certainly not exceed twenty lacs, this project would probably be remunerative.

† *i. e.*, after the proper reductions for evaporation, quantity taken by existing tanks, &c.

5. Besides its value as a source of supply for irrigation, this reservoir would be of great service in reducing the volume of the Yerrakalwa floods which have to be passed on across the Delta between embankments.

6. DELTA PROJECT.—The operations in the Delta deserve no special notice, except that they have proved that the Civil Engineering College cannot turn out efficient Surveyors and Levellers for the Public Works Department.

7. About 380 miles of correct levels were, after much trouble and delay and at very heavy expense, obtained.

8. These levels of course have not brought to light any new information, they were necessary only for the preparation of the drawings and estimates of the project for the completion of the Delta works.

9. VIZAGAPATAM.—In Vizagapatam there were no survey and levelling operations in connection with new irrigation project.

10. GANJAM.—In Ganjam, Captain Beckley has, since May last, been engaged in seeking for sites for reservoirs, &c., in a thorough examination of the whole of

the valley of the Rooshkoolia below the ghauts, with a view to the preparation of a complete scheme for ensuring a certain supply of water for extending irrigation in that district. I have not yet received the report called for from that Officer, in accordance with your Memorandum, No. 78. But I will not further delay the submission of this report The Ganjam report shall be transmitted immediately it is received, and, in the meanwhile, a general preliminary report, just received from Captain Beckley, will be forwarded in a day or two, which will exhibit the general scope and principal results of the investigation made by that Officer.

Endorsement of the Superintending Engineer, 1st Division, dated 12th November 1868, No. 159.

From the Executive Engineer on Special duty, Ganjam, to the Superintending Engineer, 1st Division, dated Camp at Aska, 8th November 1868, No. 114.

I have the honor to submit the following report of work done in connection with investigation of Irrigation projects in the Ganjam District. I may, however, remark that a report and plan showing work done has already been submitted.

1. The object in view is to irrigate a considerable portion of the valley of the Rooshkoolia by means of river channels, supplied in part with water stored in reservoirs. No sites for reservoirs have been definitely fixed upon, but many miles of country have been inspected.

2. One hundred and fifty-nine miles have been levelled, surveyed, and plotted, the levels have been checked and found correct. Sections of the Mahanuddy and Rooshkoolia have been taken at sites of proposed weirs, also at Aska above and below junction. Observations have been and are being taken to determine rain-fall and daily discharges of Rooshkoolia and Mahanuddy at Aska.

3. The results have been set forth in a previous report, so far as present investigation admits of my forming an opinion as to the works that would prove most beneficial to the country.

Preliminary Report upon proposed Irrigation Works in North Ganjam.

1. The principal physical feature of North Ganjam is the Rooshkoolia, this river rises in the Khond Hills above Goomsoor, near Aska ; it is joined by the Mahanuddy with a stream larger than its own, also flowing from the Eastern Ghauts, five miles lower down the Donaye falls in on the left bank, and ten miles below Aska the stream is augmented by the Godahallow flowing in on right bank from the range of hills situated to the west of the Military Station of Berhampore ; the Rooshkoolia enters the sea at Ganjam, formerly a most flourishing port and chief Civil and Military Station in the Northern Circars, still a place of considerable trade, but shunned both by European and Natives on account of its unhealthiness ; the causes of sickness are happily removable, and as no other place in the vicinity possesses equal natural suitableness for trade, not much will be done towards improving the district before it will become evident that works must be undertaken to restore to Ganjam its former supremacy over the numerous small ports dotted along an extensive line of coast

2. The basin of the Rooshkoolia comprises an area of 2,400 square-miles, of which perhaps 1,000 square-miles is mountainous, the remaining 1,400 square-miles consisting of undulating ridges and valleys broken by numerous isolated hills, composed for the most part of gigantic gneiss and granite boulders ; in this large area is contained the Government talooks of Berhampore and Goomsoor, and Zemindaries of Daracotta, Atagudda, Cullycotta, Beridi, Shargaddah, Coorla, and Kimedy.

3. The people subsist principally upon rice, and on the success of the rice cultivation the general welfare of the district depends ; the cultivation of raggy has been of late wisely increased, some of the ryots being warned by the last famine not to depend entirely on their rice fields for

support. Gram and oil seeds are grown on the high lands. No cholum is grown ; this is to be regretted, as it requires but little rain, is more nourishing than rice, and for cattle both grain and stalks constitute excellent food ; sugar-cane gardens are very numerous, and great trouble and expense are lavished on its culture.

4. The entire rice crop is dependent upon the local rains, a considerable portion receiving little more than what actually falls upon it ; the best rice ground is imperfectly irrigated by natural drainages and hill streams, the supply of water being somewhere supplemented by means of small tanks, mostly without sluices or calingulahs, but very useful in enabling large areas of cultivation to tide over a short cessation of rain. Of important tanks or river channels the district is all but destitute. There are, I think, but two irrigation works that would, in the Bellary District, yield Rupees 500 revenue : under these circumstances the yield of grain on the uplands is at the best but scanty ; in favorable years fair crops are obtained in the valleys ; during average seasons the ryots after much anxiety have to mourn over the crops lost and make the most of those saved ; in bad years nearly the whole crop is lost, and a scarcity or famine of greater or less intensity results.

5. The sugar-cane, though often injured by drought, is seldom altogether lost, the gardens being usually close to the river, and receiving from the villagers every care and attention. The total cost of cultivating an acre of sugar appears to be about Rupees 150, and its value on the ground about Rupees 200.

6. The district is tolerably well off for roads, but difficulty is experienced in keeping them in repair no good gravel being obtainable, the rocks being almost exclusively felspathic. The draught cattle are nearly all agricultural animals, very small and weak indeed ; I have not seen a single bullock here fit to be yoked to a cart. Buffaloes are much used for drawing bandies, they are not adapted for the work, being very slow and soon knocking up in the sun when unable to bathe or wallow in the mire ; the introduction into the district of a better breed of cattle, and of cholum to feed them with, is most desirable, and should receive attention.

7. The general condition of the district must, I think, be pronounced unhappy, and such as to demand amelioration. The prevailing custom of growing rice upon lands depending solely on the rains for irrigation, must always be a source of anxiety to the people and to Government, and must produce famines periodically, perhaps the oftener now that high prices and other causes have given a great impetus to the export grain trade ; the soil is rich and fertile ; there is little barren or stony land, the hills rising abruptly from the plains ; the rain-fall is very large though not excessive, and though variable never appears to fail ; all parts have short easy access to the sea ; but notwithstanding all these advantages, Kurnool and much of the Bellary District evince signs of far greater prosperity than Ganjam ; doubtless much of the squalor and wretchedness observable around is due to the apathetic character of the Ooriahs, and one great argument in favour of large Public Works, is that through them the people would be trained to labour and their indolence gradually overcome.

8. But though appearances might lead one to form a contrary opinion, undoubtedly the general welfare of the district has advanced considerably, during the last twelve years the revenue has risen from Rupees 15,74,143* to Rupees 27,29,045, the increase being chiefly obtained from larger salt sales ; the trade in this article still admits of further expansion. Much of the increase of Rupees nine lacs revenue from this source during the last twelve years is attributable to the formation of roads, and it can hardly be questioned that the few lacs expended on communications between the coast and the interior have yielded cent. per cent. through the salt trade alone ; the recent famine has of course seriously checked this progress, and the recurrence of such calamities can hardly be prevented except by very extensive irrigation works. The people are naturally disinclined to change their ideas on agriculture, and grow other crops on land specially prepared for rice, in such a manner as to represent a capital of at least a million sterling. The importance of irrigation works in this district must be measured, not only by the prosperity they will induce, but also by the misery and loss they will prevent ; the immediate cost to Government of the late famine

* *Vide* Famine Report, page 6.

was estimated by Mr. Gregg, Madras Civil Service, at six lacs of Rupees; but this did not include loss by decrease in consumption of salt and many other indirect and remote losses, such as a permanent rise of nearly twenty per cent. on labor upon Public Works, a rise due not to any wholesome cause, but to the worst of all possible causes, death by starvation of the laborers; we should probably very considerably under-estimate loss to Government of late famine in setting it down at ten lacs.

9. Whilst considering Ganjam famine years, it is quite necessary to bear in mind that a rain-fall there constituting a year of drought, would in most parts of India be regarded as ample. I have no reliable data of rain-fall previous to 1863, and probably the accompanying register does not include a very wet year when the average fall over the district might reach sixty inches. A fall of forty-six inches is sufficient to ensure a satisfactory season if distributed over both monsoons, in the so-called years of drought, 1864 and 1865, that preceded the last famine, the register shows falls of 33·5 and 31·2 respectively in both years, especially in the latter, the deficiency is mostly accounted for by the failure of the October's rains, *i. e.*, the north-east monsoon; a perusal of this rain register affords us two important facts, viz., that in the worst years sufficient rain falls to fill tanks or reservoirs ordinarily well situated, and secondly, that rice crops would be safe under reservoirs holding in reserve as little as one month's supply of water.

10. That nearly all the irrigation works fail to alleviate the general distress during famine years is due to their insignificant dimensions, and also being intended for ordinary years; in very bad seasons a small tank capable of saving fifty acres of paddy is rendered entirely useless by water being drawn off for 100 acres, until the tank is empty. The only two important works in the neighbourhood that I know of, and to which I have alluded to, have answered perfectly. (1.) The Koratholy tank, an old work, is fed by a channel from the Godahallow, which has recently been improved, and a weir thrown across the river; the crops under this tank have never suffered, no remission on a revenue Rupees 15,000 has ever been made; and the ryots during bad years make very large profits. (2.) The Boary Reservoir was constructed by the British Government in the year 1861, at a cost of Rupees 10,749; the total area deriving water from this tank is 1,632 acres, paying a revenue of Rupees 10,172, an increase of Rupees 1,845 on the old revenue, due to a water-rate of little more than 1 Rupee per acre; the average yearly repairs amount to Rupees 70, so that seventeen per cent. is derived upon the original cost of construction. The lands under it had an ample supply of water during the famine year, and there was no remission of rent or water-rate.

11. The most remunerative manner of laying out a few lacs of Rupees would probably be to construct several reservoirs in well chosen sites, and trust mainly to existing channels for distribution of the water; but to irrigate extensive areas by means of reservoirs long and expensive, distributing channels must be excavated, and this being the case, it is obviously wise and economical to lead them from or through the principal rivers, from which throughout a great portion of the irrigating season they will convey water that has not undergone the expense of storage and which would otherwise flow unheeded to the sea, the reservoirs being drawn upon when the river's supply begins to fail. I consider also that any channel that will for many months in the year consecutively convey a large body of water should, if possible, be made navigable; irrigation works alone, though they will afford sufficient food for the people, will not, unaided by railways or canals, civilize the country, nor awaken the minds of the Soriahs from the wretched apathy that now debases them; neither will the waste lands be taken up, nor any land properly cultivated so long as there is a constant demand against the agricultural cattle for draught work; much of the rice crop that is this year lost would have been saved had it been planted a month earlier, which it would have been had not the ryots been tempted to hire out their cattle to the very last moment that appeared to give them time for ploughing.

12. In a country like Ganjam, where the natural supply of water is almost, though indubitably not, sufficient for irrigation, water artificially stored is unquestionably of the highest value. In the Godavery, where the soil is not more fertile than here, an acre of land pays Rupees 2 Kist and Rupees 4 for water, and it is universally admitted that this total rent of Rupees 6 is very light and might well be increased to Rupees 10.

In Ganjam the Kist levied is as follows :—

	RS.	A.	P.
On artificially imperfectly irrigated land	2	15	4
On wet lands depending on local rain	1	14	7
Dry land	1	5	9

But we may assume that land thoroughly irrigated and fertilized by river water would bear a total charge of Rupees 6 per acre, and that land irrigated to a less degree could afford to pay Rupees 3. Communication through the country being improved, the channels in the Godavery are now usually made so as to discharge a maximum of two cubic yards per hour per acre for the land they irrigate ; but for many years Sir A. Cotton's rule of one cubic yard per acre was followed and generally found sufficient, two cubic yards only being required at the commencement of the season, just to enable all the fields to be planted and ploughed at the same moment. I believe in the Godavery Delta one and a half yards per hour per acre to be sufficient for a channel to convey, and that here where the rain-fall is much greater, and the configuration of the country so favorable to irrigation by drainage, a channel need only be required to be of a capacity to discharge three-quarters of a cubic yard per acre per hour, and that with this quantity supplied when wanted crops will reach perfection.

13. The irrigation scheme I propose, consists of channels contoured on as high a level as is convenient down either slope of the valley of the Rooshkoolia, leading from weirs built across the Mahanuddy and Rooshkoolia ; during moderate weather these channels will convey the river water direct to the fields, during wet weather they will fill the small tanks lying below, and when the water in the rivers falls low will be supplied by reservoirs from above. My observations and levels have hitherto been chiefly directed to the right bank and Doab ; the guiding difficulty in contouring this channel is the obstacle offered by a considerable mass of hills situated between Aska and Injelly, approaching so close to the Rooshkoolia that the upper part of he broad valley of the Godahallow could not be reached by working round on that side except by a very long and difficult route, and not then probably without serious loss of level ; we are consequently forced to enter on the Godahallow through a ridge joining the Aska to a still higher range of hills, the summit level of this ridge is M. S. L. + 200 feet, by constructing a weir on the Rooshkoolia immediately below the confluence of the Janemilly Nullah upon a granite barrier there met with, its crest being level with highest flood line or M. S. L. + 175 feet, and allowing a fall of six inches per mile, the cutting under the summit level will not exceed 30 feet + 5 feet depth of channel say 35 feet ; from the Rooshkoolia weir I would lead a channel to the Mahanuddy below the confluence of the Barata Nullah, and there place a weir with crest up to level of highest flood or M. S. L. + 183 feet, so that this channel, primarily intended to supplement the supply in the Rooshkoolia, would have a fall of eight feet in seventeen miles ; between the two weirs a somewhat formidable cutting appears necessary, which further exploration may possibly show may be avoided.

14. Every facility exists for constructing the two weirs, and very little masonry will be required on the channel that connects them, the cutting above alluded to being the only expensive portion of this section. Below the Rooshkoolia weir the levels are favorable, until the Shargaddah ridge is reached near Soonamoe. Cutting through this ridge will cost a large sum and occupy much time and labor, as much rock will probably have to be removed, still the cost need not be extravagant if the work be done systematically and suitable and powerful machinery employed ; the blasting might perhaps be facilitated by the use of Dynamite, the stone blasted would certainly be valuable, as building stone is seldom to be picked up in this district, but has to be quarried : immediately below the cutting the Shargaddah Nullah must be crossed, and a little further on the main stream of the Godahallow, this river is spanned near Injelly by nine 30-feet arches, the rest of the line on to Chetterpore is quite free from formidable obstacle ; from the Mahanuddy to where the channel crosses the Berhampore road, the channel bed might have a continuous slope not exceeding six inches per mile, so as to be well adapted for navigation ; near the point where the road is crossed, to drop the channel bed may be found advisable, and then continue it with a uniform slope on to Chetterpore where it would command the low land to the south of Ganjam and might terminate for the present.

22

Proceedings of the Madras Government, Public Works Department, 27th January 1869.

15. The drainages crossing the line of canal will be received into the channel, or passed under, according to circumstances. Streams irrigating considerable areas of land would mostly be passed under, especially through the Zemindary estates, as the most economical arrangement and also to avoid water disputes ; we should throughout the scheme interfere as little as possible with existing irrigation ; the Godahallow might be crossed by a weir, probably an aqueduct with weir and sup ply channel above would be preferable, constructed so as to prevent sand from entering the channel, the removal of which would be an endless source of trouble and expense.

16. I should propose that the canal should be from five feet to six feet deep, and that it should be entirely within soil where the excavation is easy, for the reasons usually assigned in favour of such a mode of construction ; to avoid rock, however, it would for portions of its length be taken partly or entirely within embankments.

17. From returns received from the Collector it appears that, belonging to the Government talooks there are commanded by the proposed channel—

17,369 Acres of irrigated land.
102,852 Acres rain irrigated or dry.
20,000 Acres waste that can be cultivated.

This is only a rough calculation, and the Revenue Survey now in progress will probably show a considerable excess over this estimate. In addition to this Government land, there are under the proposed channel 142 square-miles of Zemindary estates, so that probably we might have to irrigate immediately about 200,000 acres more or less thoroughly.

18. I propose that the canal joining the two anicuts shall be constructed to carry 60,000 cubic yards per hour, and that the main canal from the Rooshkoolia be of capacity to convey 120,000 cubic yards per hour through the Shargaddah cutting ; this quantity to be gradually reduced after passing Dogoopoody, as we approach the termination at Chetterpore.

19. To attempt to make an estimate of the cost of the project would be mere waste of time, until the general approval of Government has been accorded to the proposed works ; nor has the proper moment arrived for determining the quantity of water that it is desirable to store upon each of the principal rivers ; there appears no reason to doubt but there would be an increase revenue of five lacs per annum from the south bank channel alone, and the works might be credited with five lacs on account of half the cost of a single famine, also with at least quarter of a lac per annum on account of increase salt sales. The reservoirs, although quite a necessary adjunct to the scheme, need not be taken into account in the first estimate, the cost of constr ucting them would be amply repaid by the revenue they would yield on the second crop, as in ordinary years they would be full in the beginning of November ; after a failure of the north-east monsoon this would not of course be the case, as they would have been emptied in saving the first crop.

20. Navigation canals and other important works in the district should be pushed on with now, as the irrigation works when once commenced will require all the labor available. (1.) The canal from the Chilka lake to Ganjam though not perfected is completed and navigated, the survey and estimate for continuing this canal on to Gopaulpore are nearly ready. (2.) A still more important canal would be one from Ganjam to Aska, where it would join the main irrigation canal and finally terminate at Russelcondah. I would recommend that orders be issued for surveys and estimates for the first section of this work, viz., from Ganjam up to Injelly, this canal would pass through a highly cultivated tract of country, at present quite impassable for carts or even laden bullocks for more than six months in the year ; and it would also be the means of draining a considerable area of marsh land. From the imperfect returns before me, I should estimate that the traffic upon it would be about 40,000 tons annually now carried on roads, at 2 Annas 6 Pice per ton per mile ; the cost of carriage by canal would be 6 Pice, so that if another 6 Pice were charged as a toll, the return on a length of twenty miles would be 25,000 Rupees per annum. Such cheap inland water communication would give an impetus to the salt trade, and there would be a considerable saving in cost of road maintenance ; taking advantage of existing channels the cost of excavation would not exceed one lac of Rupees, the rise of eighty feet would be attained by ten 8-feet lift locks 60 feet × 10 feet, costing 80,000 Rupees, total cost of work certainly not more than two lacs.

21. A copy of this report will be forwarded to the Governor's Agent and Collector of Ganjam, from whom I have received every assistance applied for, and who will doubtless strenuously advocate the execution of works calculated to promote the prosperity of the district, and to raise the depressed condition of the people.

CHETTERPORE,
28th October 1868.

(Signed) T. BECKLEY, Captain, R. E.,
Executive Engineer on special duty, Ganjam.

151.

SUBMITTED to the Chief Engineer for Irrigation for perusal, to be obligingly returned. A sketch map and sections not yet received, will be forwarded as soon as they come.

DOWLAISHWERAM,
4th November

(Signed) J. G. RYVES, Captain, R. E.,
Superintending Engineer, 1st Division.

FORWARDED to the Chief Engineer for Irrigation, with reference to his Memorandum, No. 78, and in continuation of letter No. 150, dated 3rd November 1868, from this office.

(Signed) J. G. RYVES, Captain, R. E.,
Superintending Engineer, 1st Division.

From the Superintending Engineer, 2nd Division, to the Secretary to Government, Public Works Department, (Irrigation Branch,) dated Camp at Masulipatam, 1st July 1868, No. 44.

1. In reply to G. O., No. 1,824, dated 10th June, requesting to be furnished with a brief statement of the survey operations that have been carried out during 1867-68, in connection with new Irrigation projects, I have the honour to inform you that the services of the special establishment assigned for that purpose have been principally devoted to the development of the large and important project for irrigation in the Northern Delta of the Pennair river in the Nellore District. These operations have been carried on under the very able superintendence of Mr. R. Smith, Executive Engineer, who has been assisted by three trained Surveyors, Mr. Berlie, Serjeant Appleby, and C. Sasha Chellem Moodelly, all of whom have pursued their work in a zealous and systematic manner, with which I have every reason to be satisfied.

One Plan.

2. The general scope of the project may be thus stated :—

The Anicut at Nellore only ensures the irrigation of the Southern Delta of the Pennair. With the exception of small channels taken off to some of the principal tanks, the Northern Delta has been neglected. Including the lands adjoining the Delta an area of not less than 1,50,000 Acres may be commanded by a channel taken off at Sungum, but the whole of this is not available, first, on account of much land being retained for villages, topes, &c., and secondly, on account of the limited supply of water obtainable. Mr. Smith has taken the worst year (1863) of which there is record, as his guide in calculating the water available and in planning all his channels and masonry works. With every deduction made, 80,000 Acres can surely be watered annually on the north of th[e] Pennair. The plan* I send will, I conceive, show the boundaries of the irrigab[le ar]ea better than I can describe them in writing. Mr. Smith reports as follows :—

* Requested to be returned.

" 5. The lines for the main chann[e]ls have all been decided on, and most of " them have been set out, surveyed, and levelled. Preparatory to staking out the

" channels, an accurate outline of the country was obtained by numerous sec-" tions* taken from different points, " on the left bank of the Pennair, across " the main water-shed to the Pydaru, north of this river, also a series of levels have " been taken to ascertain the elevations and depressions in that locality. A survey " of the Kanigerry tank showing the present and proposed capacities has been " made, the Duvuru and four other minor reservoirs have also been surveyed."

* Classed as "initial levels" in the epitome.

" Subjoined is an epitome of the *principal* work done—

Channels set out and surveyed.	Detailed longitudinal and transverse sections of channels.	Initial Levels.	Miscellaneous Levels.	Tanks surveyed.	Tanks partially surveyed.	Remarks.
Miles.	Miles.	Miles.	Miles.			
105	186	281	121	8	18	The levels have all been reduced to mean tide.

" 6. From the available information it is evident the project will be a remu-" nerative one, but to what extent I am not prepared to state, as the detailed esti-" mates of the cost of the works have not been framed; I think, however, a return " of ten per cent. may be confidently expected, and if the water-rate is increased " from Rupees 4 to Rupees 5 per acre " as has been proposed† for irrigation " *under river channels*, in Mysore, a very " handsome profit would be the result."

† Judging from a report published in the "Madras Times" a few months ago.

3. Another scheme that has been taken up systematically is one for irrigation from the Muniar, a tributary of the Kistna. The surveys and levels have been well carried out by Surveyor Haimsing. Probably about 15,000 or 18,000 Acres will be supplied, but no register of the river having been kept in past years, I am not yet in a position to submit the project to Government.

4. Captain Smith, R. E., was employed for about a month on a project for supply of water to Dondapaud tank near Vinconda, which he labored at with zeal, but being attacked by the virulent fever that prevails in that portion of the country, he had to proceed to England before his plans were fully matured. I hope, however, that during this year something definite in the matter will be decided on. At present there is a doubt if the irrigable land under the tank is sufficient to repay the cost of its restoration.

From the Superintending Engineer, 3rd Division, to the Secretary to Government, Public Works Department, dated Bellary, 28th August 1868, No. 1,925.

With reference to G. O., No. 1,824, of the 10th June 1868, I have the honour to submit the accompanying statement showing what progress was made up to the end of June in the investigation of the several new irrigation projects in this Division.

Statement referred to in letter No. 1,925, *dated 28th August* 1868.

Bookacherla Project.—This project comprises the construction of an Anicut across the Pennair river near Nagutmuddika, in about latitude 14° 10′; for taking a channel running north-

ward round the Pairoor Doobrampully tank, and then through the ridge into the drainage falling into the Budrapoor tank ; for putting an anicut across the surplus channel of this tank near Ganulapurty, and turning the water into the Bookacherla tank, which it is proposed to raise and improve. Survey and levels completed. Estimates under examination.

Roddum Project.—This project comprises an Anicut across the Pennair river below Ootacoor, in latitude 13° 55′, to supply the Cullapee and other tanks as far as C. Codyhully or Roddum large tank. The survey and levels only lately commenced, but should be completed by end of August.

Hindoopoor Project.—This project comprises an Anicut across the Pennair river about a mile above Keerkerra, in latitude 13° 45′, with channel for supplying the Hindoopoor, Cuggull, Cotanoor and other tanks, down as far as Ootacoor. Survey and levels nearly completed, but further information called for. These three projects are being investigated by Ensign and Assistant Engineer J. Gray.

Huggry or Hoshully Project.—It is proposed to construct an Anicut across the Huggry river near Joonjaramanhully, in latitude 14° 38′, longitude 77° 3′ E., and to take a channel to supply the Yaparaul tank, Hoshully tank, which is to be raised and improved, and the Cunnakul tank.

The survey, &c., of this project was commenced in July 1867 by Serjeant Power of the Sappers and Miners, who however was obliged to resign in October 1867, in consequence of ill-health. It was again taken up in January by a Mr. Ross, a young Surveyor, who however was obliged to resign after a short time from ill-health : it is now (since middle May last) being surveyed by a Mr. Wylie. Up to end of June the work done only comprised Hoshully and Cunnakul tanks with all the proposed improvement.

Potalcoonta Project.—This is for constructing a tank in about latitude 14° 10′, longitude 77° 46′, above the village of Potalcoonta and across the drainage from the direction of Pennacondah.

The survey and levels are completed. Estimate under preparation. This work was surveyed and levelled by Mr. Surveyor Dady.

Suggly Air Project.—This project, which is in the Budwail talook, Cuddapah District, is for an Anicut in latitude 15° 9′ and longitude 78° 59′ E., across the Suggly Air, to take the water by an old channel to the Poremamla and Budwail tanks. It is being surveyed and levelled by Mr. Surveyor Dady, under the orders of Mr. Supervisor Lewis. The channel has been surveyed, &c., as well as the Poremamilla tank, and work is now being closed.

From Mr. J. W. LEWIS, Supervisor in charge of Poddatur Range, to the Superintending Engineer, 3rd Division, dated Camp at Nundyalumpett, 4th December 1868, No. 465.

With reference to your docket, No. 3,116, dated the 23rd ultimo, I beg to enclose a statement showing the expected revenue under the several irrigation works that will be benefited by the proposed canal. I am unable to supply the information in a complete form as required, but I have applied to the Tahsildar for the same, and will submit it on immediate receipt. The total increase, you will perceive, will be about Rupees 19,700, or about thirteen per cent. of the estimated amount.

The canal will be ten miles and one furlong in length, but as the line passes through the Chintallopully tank for one mile, the total length of excavations will be nine miles. The width of the canal throughout to be fifteen feet, with slopes of one and a half to one, and to allow of a head of six feet of water. The grade from the first to the fourth mile will be one and a half feet per mile, and for the remaining distance two and a half feet per mile. The average discharge is 520 feet per second, and as the capacity of the Poremamilla and Chintallopully tanks amounts to 32,019,662 cubic yards, these reservoirs will be filled in about twenty days of monsoon, the remaining days being made available for the other tanks benefited, viz., the Kalsapaud, small, Pendlimury, Peddoogoopully, Akooshttipully, and Rungasumoodrum tanks.

The length of the Anicut will be 250 feet, and to be six feet above the deepest part of the river bed. The crest of the dam will be on a level with ordinary flood line. The afflux caused by the erection of the dam will raise the highest flood line by two feet ; but as the banks are high, no other works will be required to protect the fields from inundation.

I annex a Memorandum showing the details, &c., of the probable estimate for the entire project.

Statement showing the increase of revenue to be derived by construction of the proposed canal to the Poremamilla tank.

Name of village.	Name of work.	Number of acres that will be brought into cultivation.	Tirvajasty at Rupees 5 per acre as per Gazette order.	Fasiljasty. Acres.	Fasiljasty. Assessment.	Total increase.	Remarks.
		A. C.	RS. A. P.	A. C.	RS. A. P.	RS. A. P.	
Poremamilla	1. Big tank	1,000 35	5,004 8 0	1,192 4	3,401 0 0	8,405 8 0	
	2. Rungasmudrum tank	19 15	96 14 0	122 34	437 2 6	534 0 6	
Sunkavaram	1. Akisiddoopully do.	241 9	1,205 0 0	......	......	1,205 0 0	
	3. Nallyondapully do.	10 29	53 12 0	......	......	53 12 0	
	3. Peddoogoopully do.	50 0	250 0 0	......	......	250 0 0	
	4. Chintallapully do.	493 30	2,468 12 0	......	......	2,468 12 0	
	5. Kullakindapully sluices	635 33	3,179 0 0	102 20	302 0 0	3,481 0 0	
Pendlimurry	1. Pendlimurry tank.	11 4	55 10 0	36 0	150 0 0	205 10 0	
	2. Oblapoorum do.	43 8	216 0 0	32 0	100 0 0	316 0 0	
		2,506 5	12,529 8 0	1,485 18	4,390 2 6	16,919 10 6	
	By sluices in the Channel itself.						
Sunkavaram	1. Karanamianpully ...	95 35	479 7 0	......	......	479 7 0	
	2. Ramapoorum ...	146 36	734 10 0	......	......	734 10 0	
	3. Nallagondapully ...	156 14	781 14 0	......	......	781 14 0	
Mamillapully	1. Mamillapully ...	41 31	208 14 0	......	......	208 14 0	
Kalsapaud	1. Kalsapaud ...	....	......	62 0	615 0 6	615 0 6	
		440 38	2,304 13 0	62 0	615 0 6	2,819 13 6	
		2,947 3	14,734 5 0	1,547 18	5,005 3 0	19,739 8 0	Total increase.

CAMP, NUNDYALUMPETT,
4th December 1868.

(Signed) G. W. LEWIS,
Supervisor, Poddatur Range.

(True Copy.)

(Signed) A. S. MOBERLY, Major, R. E.,
Superintending Engineer, 3rd Division.

Proceedings of the Madras Government, Public Works Department, 27th January 1869.

Probable Estimate for proposed Canal into the Poremamilla tank.

Items.	RS.
Earth-work, excavating canal into banks, &c.	75,000
Raising Chintallopully tank six feet, constructing new escape and sluices	7,000
Anicut	20,000
Head sluice	5,000
Aqueduct over Polu Vagoo	7,000
Do. four more water courses	10,000
Two Road bridges	4,000
Five Sluices	1,500
Twelve Under Drains, &c., to pass Irrigation channels, &c.	3,000
Compensation for lands and sundries including Superintendence, Overseers, and Store Sheds	17,500
Total estimate...	1,50,000

CAMP, NUNDYALUMPETT,
4th December 1868.

(Signed) G. W. LEWIS,
Supervisor, Poddatur Range.

Assume two lacs as the cost and the increase revenue at 20,000 Rupees, shows a return of ten per cent. or eight per cent. after deducting for repairs.

(True Copy.)

(Signed) A. S. MOBERLY, Major, R. E.,
Superintending Engineer, 3rd Division.

Statement showing the Ayacut and Cultivation of Fusly 1277 *under the Hosahully (hamlet of Canekal in Raidroog) tank and the land that could be brought under cultivation by the proposed improvement to the said tank.*

Ayacut wet.				The extent, &c., of the land that could be cultivated if the tank is improved. *Vide* Superintending Engineer's docket, No. 2,663, dated 24th October 1868.													Remarks.
Circar.		Inam.		Circar dry.									Inam dry.		Total.		
					Cultivation.												
Acres.	Assessment.	Acres.	Assessment.	Name of the Village.	Acres.	Assessment.	Ayacut Bunger, Acres.	Unassessed waste, Acres.	Total Acres.	Amount Rs.——, if wet rate at 8Rs. an acre be charged in column 10.	Deduct the assessment on dry cultivation, *vide* column 7.	Amount to be realized to Government.	Acres.	Amount of water rate if charged at 8 Rs. an acre.	Acres of columns 10 and 14.	Assessment of columns 13 and 15.	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
401	1,286	11	27	Canekal ...	1,003	290	5,594	...	6,597	52,776	290	52,486	1,237	9,896	7,834	62,382	Ryots are not willing to pay assessment at Rs. 8 per acre for the land that could be cultivated by improving the tank, but they have executed an agreement to pay Rs. 4 for a single crop, per acre.
				Yerragoonta ...	20	5	80	...	100	800	5	795	253	2,024	353	2,819	
				Vapparallu ...	...	...	145	...	145	1,160	...	1,160	...	...	145	1,160	
					1,023	295	5,819	...	6,842	54,736	295	54,441	1,490	11,920	8,332	66,361	

Dorojee,
30th November 1868.

33,180½ at 4 Rupees an acre 1st crop assessment.
16,590¼ Fasaljasty on 2nd crop assessment.

49,770¾ Total.

(Signed) H. SULLIVAN,
Collector.

The cost of this project I calculate will be about seven lacs. The Collector has only entered increased revenue under Hosahully tank, but there will be also increase under the Yaparaul tank. Taking 50,000 as the increase and omitting Fasaljasty altogether shows a return of seven per cent. or five per cent. after deducting for repairs.

(True Copy.)

(Signed) A. S. MOBERLY, Major, R. E.,
Superintending Engineer, 3rd Division.

Memorandum of the probable cost of the Hindoopoor Project.

	RS.
Anicut ...	40,000
Head Sluice ...	4,000
Five Waste Weirs ...	5,000
Twenty Drainage inlets ...	2,000
Two Tank supply Sluices ...	500
Two Tank Sluices ...	500
Improving Suddlapully tank ...	5,000
Do. Streekuntapoorum tank ...	6,000
Raising Poolcoonta tank ...	3,000
One Bridge ...	2,000
One Aqueduct ...	500
Eleven miles of channel 33 × 5 feet at 8 cubic yards ...	44,352
Sundry stone revetment ...	2,000
Tamping at rear of do. ...	300
	115,152
Other charges ...	11,515
Total...	126,667

Assuming the cost at 1,50,000 and the increase revenue at 9,800 Rupees, the return would be 6½ per cent., deducting 2 per cent. for repairs, there would be a gain of 4½ per cent.

(Initialed) A. S. M.

Memorandum of Revenue of tanks to be benefited by the Hindoopoor Project taken from the Tahsildar's Statement, dated 16th July 1868.

Tanks.		Highest Revenue	Average Revenue.	Difference.	Minimum Revenue.
		RS.	RS.	RS.	RS.
Hoolicoonta ...		994	757	237	618
Cuggul ...		1,535	1,131	404	557
Kirkerra ...		1,956	1,360	596	988
Buswanpully ...		1,043	799	244	704
Streekuntapoor ...		1,176	944	232	735
Hindoopoor	Soogoor ...	4,600	3,870	730	2,824
	Soudapa ...	1,237	964	273	455
Cotnoor.	Cotnoor ...	4,879	2,414	1,965	749
	Malapooram ...	2,355	1,809	546	1,222
	Sasancotta ...	2,135	1,542	593	855
Ootacoor.	Ootacoor ...	2,690	2,024	660	1,070
	Buhganpully ...	4,512	2,456	2,056	1,171
	Suddlapully ...	319	260	59	196
				8,595	
New land, 300 Acres at 4...				1,200	

9,795 8 per cent. or better on proposed expenditure.

BELLARY,
27th November 1868.

(Signed) J. GRAY, *Dy. Asstt. Comy.*,
Asstt. Engineer.

(True Copy)

(Signed) A. S. MOBERLY, Major, R. E.,
Superintending Engineer, 3rd Division.

Proceedings of the Madras Government, Public Works Department, 27th January 1869.

Memorandum of the probable cost of the Roddum Project.

	RS.
Anicut	40,000
Head Sluice	3,500
Five Water Weirs	4,000
Ten Drainage inlets	900
One Aqueduct	400
Cholamary tank, raising, Calingulahs 2 feet and building a Sluice ...	500
9¾ Miles 152 yards of Channel, 33 × 5 feet, at 8 cubic yards per Rupee.	39,660
Sundry stone revetments	2,000
Tamping in rear of do.	300
	91,260
Other charges	9,126
Total...	1,10,384

If we add 25 per cent. to this cost would be 1,25,000, and as return is 9,200 it would be about 7½ per cent., deducting 2 per cent. for repairs shows a gain of 5½ per cent..

(Initialed) A. S. M.

Revenue to be derived from tank taken from documents, dated 1862 *copy of late Revenue information from Pennacondah not furnished.*

	RS.
Roddum tank	4,571
Nullore	448
Cholamary	1,788
Cullapy	2,002
Cottapully	395
Total...	9,204

Rupees 9,201 = 8·17 per cent. on expenditure.

BELLARY,
27*th November* 1868.

(Signed) J. GRAY, *Dy. Asstt. Comy.*
Asstt. Engineer, D. P. W.

(True Copy)
(Signed) A. S. MOBERLY, Major, R. E.,
Superintending Engineer, 3rd Division.

From the Superintending Engineer, 4th Division, to the Secretary to Government Public Works Department, dated Madras, 20th August 1868, No. 2,432.

Two Maps.
Seven Reports.

1. With reference to G. O., No. 1,824, dated 10th June 1868, I have the honour to subjoin a brief sketch of the survey operations carried on in this Division in connection with new irrigation projects.

2. *Palmanair Irrigation Project*—Surveyed by Coopoosawmy Moodelly. The object is to secure a supply for a string of tanks from the Panjairy reservoir to Palmanair. " The large reservoir was constructed by previous Native proprietors immediately below the junction of two streams which cross the road from Palmanair to Poonganur, about five miles north of the former place, between the villages of Kotoor and Koyalur." A return of about eight per cent. is expected.

3. *Iral Project*— Is being surveyed by the same Surveyor. The Iral river is a feeder of the Poiney river, and runs from Hosoowoopully and crosses the Cuddapah trunk road at Pooterput. The object is to dam up the river near the hills,

and to turn its water to Nampully and other tanks. The survey is not sufficiently advanced to admit of a correct opinion being given as to its results.

4. *Mambaukum Project.*—Survey operations carried on by Govindoo Row under the orders of Ensign, Assistant Engineer, Bevan. About 117 square-miles of country surveyed and mapped. The site of the proposed anicut is about half a mile below where the Coillady drainage enters the Cheyaur; north latitude 12-25, east longitude 79-2-30. The southern channel runs east until it enters the Kilear river, $42\frac{5}{8}$ miles from site of anicut. Eight branch channels, aggregating in length forty-three miles, are to be excavated. The main channel runs from site of anicut to half a mile south of Serikallumbady, north latitude 12-23-30, east longitude 79-6, cuts the Polloor and Trinomallee road eleven miles from the latter place, north latitude 12-23, east longitude 79-9-30; then takes a north-east turn and enters the North Arcot District near Pandem, latitude 12-26, longitude 79-15; then runs east and cuts the road north-west of Chittapet, north latitude 12-27, east longitude 79-24-30, and there enters the Vellur tank, north latitude 12-31-30, east longitude 79-32-11. The northern channel which is $28\frac{1}{8}$ miles long, crosses the Miroogondanaddy drainage at latitude 12-62-15, longitude 79-6-15, runs through the Polloor, Cunatoor, Goodaloor tanks and ends in the Vinnamungalum tank. Nine branch channels of an aggregate length of twelve miles will be excavated to fill distant tanks. The object of the project is to supply water to 158 tanks. The information required to complete the project are the quantity of water the river can supply, and the exact quantity of land that can be brought under irrigation. The grand flaw in the project is that it will cut off the small freshes from the existing anicut.

5. *Cheyaur New Anicut Project.*—This project is spread over parts of the North Arcot and Madras Districts. The portion on the north bank of the river is being investigated by Mr. Surveyor Adolphus. About ninety-eight square-miles of country have been surveyed and plotted, and ninety-four running miles of longitudinal levels and forty-two miles of cross sections taken.

6. The portion of country on the south bank of river measuring about 130 square-miles was surveyed, and the levels were taken by C. Vadantachary.

7. The scope of the enquiry is to see if the waters of the Cheyaur, which are very abundant and which run to waste through the Palar into the sea, could not be utilized by throwing an anicut across it. It is expected that about 138 tanks, thirty in the Arcot talook, thirty-eight in that of Wandiwash, and seventy in the Chingleput Range, will be benefited by the execution of the project.

8. Its position is shown in the Trigonometrical map accompanying.

9. "*South branch to the Kambankal.*"—Partially surveyed by Mr. McGrath under the orders of Mr. Sub-Engineer Ottmann. The country embraced by the project is bounded on the north by No. 1 Trunk Road, on the south by the Palar and Vagavathy rivers, on the east by McLean's Choultry road and the town of Conjeeveram, and on the west by the old head of McLean's Channel, and lies between the parallels of 79-31 and 79-46 east longitude, extending up 80-10, and between 12-45 and 12-55 north latitude.

10. The intention is to excavate a south branch to the Kambankal for carrying off more of the water of McLean's Channel than the Kambankal is in a condition to do to supply all the large tanks south of No. 1 road, between Damul and Tennainy and further on.

11. *Cooum river and old Bungaroo Channel.*—The portion between Kasaveram and Koratoor dams surveyed by Mr. McGrath, and the position of all channels taken off the Cooum within that limit for irrigation. The levels have not yet been taken to ascertain what obstructions exist in the Cooum river between Kasaveram and Koratoor dams.

Chembrumbaukum Project.—When this project came to be executed, it was found that a serious mistake had been committed, and that if the original design were adhered to, a large valley containing some 2,000 acres of very valuable land and three large villages would be submerged. The project had to be re-investigated, in the course of which a great deal of surveying and levelling work was done. A new supply channel has been determined upon which will prevent the submersion of the lands and villages referred to, and operations which were stopped during enquiry have been commenced pending the submission of a revised estimate for the project.

12. The positions and extent of the several projects are shown in the Trigonometrical maps enclosed.

From the Superintending Engineer, 5th Division, to the Secretary to Government, Public Works Department, dated Salem, 18th July 1868, No. 71.

With reference to the Order of Government of the 10th of June, No. 1,824, I have the honour to state that the following surveys, connected with new irrigation projects, were made last year.

(1.) Survey of the tanks to be supplied from an anicut, proposed to be built across the Manimootan river, about ten miles west of Virdachellam, in the South Arcot District. The tanks, eight in number, are at present supplied by a narrow and tortuous channel, close to the river. Levels have been taken for a new main-channel and branches.

The estimate for anicut, head and division sluices and channels amounts to Rupees 54,800, and the expected increase of revenue is Rupees 11,420 from 2,178 Cawnies of land which are to be brought under wet cultivation. The survey was made by Coopoosawmy, the Draughtsman of the 4th Range Office, under the direction of Mr. R. E. Norfor, Acting Executive Engineer.

(2.) Another survey, made in the same range, was for an anicut to be built across the Myore Nuddy, about three miles due west of the 135th mile of Trunk Road No. 8, (fourteen miles west of Virdachellam,) with channel for the better supply of about 240 Cawnies of land. The expected increase of revenue in this case is Rupees——and the amount of the estimate for anicut channel, &c., is Rupees 10,770.

(3.) In the Villupuram talook a survey was in progress for a new head to several of the channels on the north bank of the Pooniar. Levels have been taken from the north main channel of the Pooniar anicut, which is about four miles east of Trikalore. The survey has not yet been completed.

(4.) In the Trinomalay talook a survey was made and levels taken for a supply channel from the Cheyaur river to the Samoodram tank, near Trinomalay. The estimate amounts to Rupees 6,200, and it has been laid aside for the present, as there are doubts of the sufficiency of the water that can be spared for this tank.

This survey and the one in the Villupuram talook have been prepared by the Talook Overseers without any extra charge for Surveyors or Draughtsmen.

(5.) In the Salem District, a survey has been made of the Bada Talah, a tank near Kristnagherri, and levels have been taken for a channel, about twelve miles in length, for its better supply from the Rendar river.

The cost of enlarging the tank, cutting the channel, building an anicut and subsidiary works, is estimated at Rupees 59,600, and the expected increase of revenue is Rupees 11,241.

The estimate and plans have been forwarded to the Collector for his counter-signature. They were prepared by the Talook Overseer under the direction of Mr. L. W. Paynter, Assistant Engineer.

From the Superintending Engineer, 6th Division, to the Secretary to Government, Public Works Department, dated Trivady, 1st July 1868, No. 336.

With reference to G. O., No. 1,824, of the 10th June 1868, I have the honor to state that no survey operations for the investigation of new Irrigation Projects have been undertaken in this Division.

From the Superintending Engineer, 7th Division, to the Secretary to Government, Public Works Department, dated Coonoor, 18th August 1868, No. 102.

1. I have the honour with reference to G. O., No. 1,824, of 10th June, to report that the survey operations connected with the Nerinjeepett anicut and channels project have been carried out by Mr. Sub-Engineer Wiffen, and the Survey party placed at his disposal in G. O., No. 1,183, of 17th April 1867, to the following extent, viz. :—

2. On the Coimbatore or right bank of the river Cauvery, for 41½ miles, extending from Myladigoondoo, the site of the proposed new anicut over the Cauvery, four and a half miles above the site of the old ruined anicut at Nerinjeepett, to the Bhowany river six miles above its confluence with the Cauvery. The exact site proposed for the anicut can be best identified on the Survey Map of India by the village of Nagapatti marked thereon, two miles below which it is. In the space included between these two rivers, according to the Revenue statements, there are about 9,000 acres of land capable of conversion from dry into wet.

3. On the Salem side, owing to very frequent interruptions from the ill-health of those employed, and due to the very feverish nature of the Cauvery valley, the line of surveys has not been fully caried out, or the extent of cultivable area ascertained. It will have to be limited to a certain extent by the existing demands for water in Tanjore.

4. Mr. Wiffen and myself have personally conferred with the Chief Engineer for Irrigation on the details of the work, and are to meet him again in September on the spot, with all the papers complete as far as possible, with a view to the entry of the project in the Budget of 1869-70.

Proceedings of the Madras Government, Public Works Department, 27th January 1869.

From the Officer in charge of Operations, Wynaad, to the Secretary to Government, Public Works Department, dated Luckadie, 19th August 1868, No. 444.

With reference to your G. O., No. 1,824, dated 10th June 1868, I have the honour to state that no survey operations in connection with the new Irrigation projects have been carried out in my Division during the working season of 1867-68.

From the Superintending Engineer, 8th Division, to the Secretary to Government, Public Works Department, dated Madura, 3rd July 1868, No. 884.

With reference to G. O., No. 1,824, dated 10th June 1868, I have the honour to forward copy of a statement of survey operations carried on in connection with the Streevigoontum Anicut Project.

Brief Statement of Survey operations carried on in connection with the Streevigoontum Anicut Project.

1. The Streevigoontum Anicut Project, as drawn up thirteen years ago, by Colonel Horsley, and submitted to Government again last year, was returned in G. O., 2,987, of 25th September 1867, in order that the estimates might provide for the extension of the channels, and all works requisite for the full development of irrigation from the proposed anicut over the Tambrapoorney.

2. In the scheme as originally drawn up a return of 16⅓ per cent. was estimated on an outlay of Rupees 2,85,000, but owing to the great increase of late years in the cost of building and rates of labor, the estimate of last year amounted to 7½ lacs, while the returns, as admitted by the Collector of Tinnevelly, were taken, at the lowest valuation, at only 5⅓ per cent. At the same time, it was considered that the two main lines of channel might be extended, and a larger area of waste lands be brought under culture, than had been exhibited in the Revenue Statements. The objects of enquiry have thus been to ascertain how far the main channels can be carried on beyond Tuticorin to the north, and beyond Trichendoor to the south, also to determine how much of the land lying waste towards the coast can be watered by the anicut channels; this waste land consisting of the high belt of sand along the sea-shore, the swamps and backwaters within this belt; and another tract containing old and useless tanks which probably never received an adequate supply of water, and below which, for years past, there has been little or no attempt to raise wet crops. Lieutenant Shepherd was deputed for the general revision of the scheme: in April, Mr. Bell, an Assistant Engineer of the 3rd Grade, just arrived from England, joined and assisted in levelling, and I have myself been in charge of survey operations since March. On the left or north bank a line of levels has been taken from the present old head sluice at Streevigoontum, along the proposed main channel by the Armugamungalum and Paycolum tanks to the Korumpullum tanks, then turning back southwards, along the Tuticorin and Trichendoor road by Paliacoil to Mukani, on the river bank (opposite to Ahtoor), and thence up the river bank to the Streevigoontum head sluice again. Another intermediate line of levels has been run, north and south, and cross sections taken, at intervals of half to one mile, extending to the west on the sand hills above the Paycolum and Armugamungalum tanks: and to the east, down to the sea. Longitudinal and cross sections have been taken of the principal tanks. For the Korumpullum tank, levels have been taken down to Tuticorin to the sea; and also from the same tank northwards, with the object of extension in that direction; but from the great rise in the ground immediately beyond Korumpullum, and continuing on, to the so-called salt river, it is evident that irrigation from the Tambrapoorney cannot be carried on further, from the head of water to be obtained by the anicut at Streevigoontum. Hence, on the north bank, there is no extension or alteration in the main features of the project: but the land being accurately contoured, it is found that some 8,000 acres can be cultivated from the channels and tanks, beyond the area for which credit has been taken

heretofore. The levels have been taken over a length exceeding 200 miles. On the south bank, a line of levels has been taken from the site of the head sluice, along the proposed main channel, through Tricalore, to the large tank called Cadumbacolum, which waters the lands of the village of Tentiraperi; then following Colonel Horsley's line, above the villages of Coorumboor and Nulloor to the Ammenpuram tank; and on by Kanum and Manukadu to Trichendoor, with a branch southwards for two miles to Ellapanaiken ruined tank. Starting from Tentirapuri again, a section has been taken, in a line parallel with the river bank, through Shedavycal to the Ahtoor tank, in order to compensate the people of Ahtoor for the diminution of water in the river channel, consequent on the anicut arresting the river water in the dry season. From Ahtoor levels have been taken southwards, through Armuganari to Trichendoor; while a parallel line has been run from Shedavycal to Kanum, and from Kanum eastwards to Armuganari, besides the above several cross section have been taken between the salt pans and Trichendoor, over the swamp and waste lands. To the south of Trichendoor, the backwater along the coast might, as stated by Colonel Horsley, have furnished the means of navigation to the Port of Colasagrapatam, but there will be no extension of cultivation beyond Ellapanaicken. Levels have been taken on the south side over a length of 150 miles.

3. Colonels Anderson and Wilkieson having gone over the country; by their direction, the main channel will not be taken through the Cadumba tank, but will pass round the spread of the tank, and without affecting the interests of the Tenteraperi people, will be carried by an enlargement of the present high level channel (being a surplus from the Cadumba tank) to the Ammenpuram tank. A sluice of distribution will be required at the entrance to the Cadumba tank for the threefold purpose of supplying that tank, of conveying the main channel round it to the south, and of throwing off a minor channel to Ahtoor. Some 800 acres of land will be brought under cultivation by the new Ahtoor channel. The low swamps about Koilputnum cannot be drained off as their level is too low, but allowing for the lodgment of water there, at least 3,200 acres of land about Nulloor, Armuganari, and towards Kanum, can be irrigated.

4. Thus on the south bank the alterations in the project consist in a diversion of the main channel, round, instead of through, the Cadumba tank, but to return to the same point, the Ammenpuram tank, and a new branch channel for Ahtoor, while an additional area of 4,000 acres will be irrigated.

5. The general result is that, without extending the length of main channels, and with but slight modifications of the original system, 12,000 acres of new land will be cultivated, giving a return, say, of Rupees 60,000, to be added to the Rupees 40,000 already estimated, or a revenue of one lac on the outlay that may now be taken at $8\frac{1}{2}$ lacs.

(Signed) H. L. PRENDERGAST, Captain, R. E.,
Executive Engineer.

(True Copy.)

(Signed) C. V. WILKIESON, Lieut.-Colonel, R. E.,
Superintending Engineer, 8th Division.

Months.	Ganjam.	Chetterpore	Munsoor-cotta.	Berhampore	Russel-condah.	Ruselcon-dah, Mr. Levers'.	Aska.	Total.	Average.	Remarks.
1	2	3	4	5	6	7	8	9	10	11
January 1863 ...	...	...	...	...	·01	...	...	·01	·001	
February ,, ...	·44	...	·62	...	·01	...	·84	1·91	·318	
March ,, ...	...	...	...	...	·25	...	·58	·83	·138	
April ,, ...	·10	...	·06	...	2·08	2·10	1·20	5·54	·923	
May ,, ...	1·71	1·70	·45	...	1·32	1·10	..	6·28	1·046	
June ,, ...	11·34	7·42	8·76	...	12·54	12·0	10·27	62·33	10·388	
July ,, ...	3·62	3·57	3·78	...	5·39	7·0	4·88	28·24	4·706	
August ,, ...	5·29	5·16	7·10	...	12·53	13·30	7·46	50·84	8·473	
September ,, ...	12·47	18·20	12·43	...	10·82	9·20	6·12	69·24	11·540	
October ,, ...	10·89	10·33	15·26	...	6·51	6·0	5·16	54·15	9·025	
November ,, ...	1·28	1·41	1·06	...	·62	...	2·14	6·51	1·085	
December ,, ...	...	...	...	...	...	...	...	...	...	
	47·14	47·79	49·52	...	52·08	50·70	38·65	285·88	47·646	
January 1864 ...	...	...	...	...	...	...	...	...	...	
February ,, ...	·17	·68	1·71	...	2·96	...	·72	6·24	1·04	Famine year.
March ,, ...	·27	1·20	1·55	...	3·10	...	2·03	8·15	1·358	
April ,, ...	·10	·24	...	...	1·57	...	1·21	3·12	·52	
May ,, ...	·45	·57	·67	...	1·13	...	4·42	7·24	1·206	
June ,, ...	4·74	5·42	4·20	...	3·50	3·50	2·45	23·81	3·968	
July ,, ...	7·91	7·66	5·58	...	9·31	8·70	5·20	44·36	7·393	
August ,, ...	3·78	7·84	7·16	...	4·50	4·50	6·67	34·45	5·741	
September ,, ...	9·38	4·19	7·40	...	4·47	4·70	7·03	37·17	6·195	
October ,, ...	5·37	4·05	3·45	...	1·06	1·0	2·33	17·26	2·876	
November ,, ...	·98	1·97	1·81	...	3·12	3·50	5·35	16·73	2·788	
December ,, ...	...	1·13	·30	...	·11	...	1·25	2·79	·465	
	33·15	34·95	33·83	...	34·83	25·90	38·66	201·32	33·553	

Register showing the Rain-fall at the undermentioned Stations from 1863 *up to* 30*th September* 1868.

Months.	Ganjam.	Chetterpore.	Munsoor-cotta.	Berhampore	Russel-condah.	Russelcon-dah, Mr. Levers'.	Aska.	Total.	Average.	Remarks.
1	2	3	4	5	6	7	8	9	10	11
January 1865 ...	...	...	...	...	...	...	...	...	...	
February ,, ...	1·70	2·71	4·70	...	2·22	...	...	11·33	1·618	
March ,, ...	2·60	5·92	1·54	...	6·36	...	5·19	21·61	3·087	
April ,, ...	2·05	...	·05	...	2·54	...	1·57	6·21	·887	
May ,, ...	1·29	1·25	2·30	2·05	5·86	...	5·46	18·21	2·601	
June ,, ...	3·50	4·75	2·83	2·0	7·05	7·50	5·42	33·05	4·721	Famine year.
July ,, ...	3·83	4·17	2·30	3·0	8·51	7·80	7·39	37·0	5·285	
August ,, ...	4·48	6·76	5·91	6·15	8·43	7·30	6·93	45·96	6·565	
September ,, ...	4·99	5·26	4·62	4·65	6·48	6·30	5·42	37·72	5·388	
October ,, ...	...	...	·21	1·50	1·70	1·10	1·45	5·96	·851	
November ,, ...	·25	·33	·26	·20	·30	...	·20	1·54	·22	
December ,, ...	...	·02	...	...	...	...	...	·02	·002	
	24·69	31·17	24·72	19·55	49·45	30·0	39·03	218·61	31·23	
January 1866 ...	·04	...	...	...	·01	·10	...	·15	·021	
February ,, ...	·70	·81	·32	...	2·66	2·50	·26	7·25	1·035	
March ,, ...	...	...	...	...	·56	·50	·18	1·24	·177	
April ,, ...	4·07	4·72	1·17	2·95	3·59	3·70	4·70	25·44	3·634	
May ,, ...	1·60	3·54	1·70	...	2·74	2·60	1·29	13·47	1·924	
June ,, ...	2·72	4·51	4·45	5·20	1·34	1·10	·83	20·15	2·878	
July ,, ...	3·89	4·62	3·14	8·0	12·88	12·50	15·70	50·73	7·247	
August ,, ...	11·08	14·47	15·34	16·0	21·97	21·70	12·47	113·03	16·147	
September ,, ...	9·69	11·35	5·95	9·60	9·19	9·10	9·28	64·16	9·165	
October ,, ...	6·08	10·93	12·14	8·30	7·73	8·60	8·94	62·72	8·96	
November ,, ...	·41	1·0	1·12	·90	1·81	1·0	...	6·24	·891	
December ,, ...	...	...	...	...	...	...	...	...	...	
	40·28	55·95	45·87	50·95	64·48	63·40	43·65	364·58	52·082	

January 1867 ...	·20	·22	·47	·35	·36	·20	·54	2·34	·334
February ,, ...	...	...	·45	...	1·12	...	...	1·57	·224
March ,, ...	1·76	2·14	·33	1·20	3·73	3·50	3·09	15·75	2·25
April ,, ...	1·28	2·55	1·35	4·60	2·95	3·30	2·42	18·45	2·635
May ,, ...	1·10	1·84	1·39	1·60	4·20	4·10	·54	14·77	2·11
June ,, ...	8·91	9·33	4·24	2·70	7·01	4·80	2·55	39·54	5·648
July ,, ...	5·66	7·48	7·99	10·10	6·41	7·20	7·73	52·57	7·51
August ,, ...	6·78	7·60	9·53	6·95	12·22	12·40	9·28	64·76	9·251
September ,, ...	8·99	7·55	7·77	7·22	8·33	8·20	13·28	61·34	8·762
October ,, ...	13·31	9·53	10·92	11·80	6·73	5·50	7·90	65·69	9·384
November ,, ...	·71	4·37	3·30	7·10	·95	...	1·05	17·48	2·497
December ,, ...	...	...	...	...	...	...	...	...	...
	48·70	52·61	47·74	53·62	54·01	49·20	48·38	354·26	50·608
January 1868 ...	·03	·01	...	...	·33	·20	...	·57	·081
February ,, ...	·90	·69	·85	...	1·24	1·20	·20	5·08	·725
March ,, ...	·69	·32	...	...	·15	...	·82	1·98	·282
April ,, ...	·64	1·17	·18	...	3·12	3·10	·46	8·67	1·238
May ,, ...	1·12	1·95	1·36	4·27	5·61	5·60	2·70	22·61	3·23
June ,, ...	7·45	7·42	9·62	9·40	11·83	13·0	14·44	73·16	10·451
July ,, ...	2·82	4·44	4·36	5·30	13·54	11·60	5·44	47·50	6·785
August ,, ...	9·15	7·13	6·06	6·95	6·25	4·20	5·86	45·60	6·514
September ,, ...	6·37	9·60	4·36	7·70	4·27	4·10	8·67	45·07	6·438
October ,, ...	...	...	...	1·80	...	...	...	...	1·800
	29·17	32·73	26·79	33·62	46·34	43·00	38·59	250·24	35·748

CHETTERPORE,

28th October 1868.

(Signed) T. BECKLEY, Captain, R. E.,

Executive Engineer on special duty.

No. 499.

ORDER THEREON, 27th January 1869, No. 247.

IRRIGATION, No. 39.

Ordered that these papers be forwarded to the Government of India :—

(Here enter No. 248, dated 27th January 1869.)

(True Extract.)

(Signed) CHARLES A. ORR, Colonel, R. E.,
Secretary to Government.

3/11/21 B...

To the Chief Engineer for Irrigation.
To Superintending Engineers.
To the Revenue Department.

Exd. S. T. Augustin.

tory, and some distance beyond, no extensive works are to be looked for from it; and, as regards the Toongaboodra, the supply, which moreover is far less regular than that of the Godavery and Kistna at the heads of the Deltas, has been placed at the disposal of the Irrigation Company,—with what result the Government are aware.

46. The most important new projects under consideration at present are the Perryaur scheme in Madura, the Sungum project in Nellore, and the Rooskolia project in Ganjam. Any others which may be brought forward are likely to be of secondary importance. The improvements to existing works, which will from time to time be proposed, will however be very numerous. They will embrace the regulation of the Cauvery and its branches in Tanjore, the construction of head sluices to the Tambraporney channels and the rectification of defects of alignment and in the distribution of water from them as well as from various other old channels. Tanks also will in many cases admit of improvement. But with few exceptions such improvements, though important as a whole, and though they will involve a considerable outlay, will not individually merit the attention of the Government of India.

I have the honor to be,
Sir,
Your most obedient servant,

MADRAS.
11*th December* 1868.

Colonel, R. E.,
Chief Engineer for Irrigation.

P. W. 1868 [illegible]

No 2926

From

The Chief Engr for Irrigation

To

The Secretary to Govt [illegible]

Dated [illegible] 1868

Recd [illegible]

No 122

Enc 30

Report on Survey operations.

No 247 - 27th Jany 1869

No 247

Ordered that these papers be forwarded to the Govt of India

Fort St George
27th Jany 1869

B. G. The Ch Engr for Irrigation
122 " Lingrs
21 " Ro [illegible]

182

Despd 29/1/69

Brief Statement of Survey operations carried on in connection with the Stree=vicoontum Anicut project.

The Streevigoontum Anicut project as drawn up 13 years ago, by Colonel Horsley, and submitted to Government again last year, was returned in G. O 2987 of 25° September 1867, in order that the estimates might provide for the exten-sion of the channels, and all works so requisite for the full development of irrigation from the proposed Anicut over the Tambrapoorney.

In the scheme as originally drawn up, a return of 16⅓ per cent was estimated, on an outlay of Rs 2,85,000, but owing to the great increase of late years, in the cost of building and rates of labor, the estimate of last year amounted to 7½ lakhs, while the returns as admitted by the Collector of Tinnevelly, were taken, at the lowest valuation, at only 5⅓ per cent. At the same time, it was considered that the 2 main lines of channel might be extended, and a larger area of waste lands be brought under culture, than had been exhibited in the Revenue Statements. The objects of enquiry have thus been, to ascertain

how

how far the main channels can be car=
=ried on beyond Tuticorin to the North
and beyond Tritchendoor to the South,
also to determine how much of the
land lying waste towards the coast
can be watered by the Anicut chan=
=nels; this waste land consisting of
the high belt of sand along the sea
shore, the swamps and backwaters on
within this belt; and another tract
containing old and useless tanks which
probably never received an adequate
supply of water, and below which,
for years past, there has been little or
no attempt to raise wet crops. Lieut.
Shepherd ——— " ——— was deputed
for the general revision of the scheme:
in April, Mr Bell an Assistant
Engineer of the 3d Grade, just arrived from
England joined and assisted in level
=ling, and I have myself been in charge
of Survey operations since March.
On the left or North bank, a line
of levels has been taken from the pre=
=sent old head Sluice at Streenigoon=
=tum along the proposed main channel
by the Arumuganungalum and Pay
=colum Tanks to the Korumpullum
tanks then turning back Southwards,
along

along the Tuticorin and Trichendoor road by Paliacoil to Mukani, on the river bank. (opposite to Ahtoor) and thence up the river bank to the Streevigoontum head sluice again. Another intermediate line of levels has been run, North and South: and cross sections taken, at intervals of ½ to 1 mile, extending to the west on the sand hills above the Payeolum and Armugamungalum tanks: and to the East, down to the sea. Longitudinal and cross sections have been taken of the principal tanks.

From the Korumpullum tank, levels have been taken down to Tuticorin to the sea; and also from the same tank Northwards, with the object of extension in that direction; but from the great rise in the ground immediately beyond Korumpullum, and continuing on, to the so called Salt river, it is evident that irrigation from the Tambrapoorney, cannot be carried on further, from the head of water to be obtained by the Anicut at Streevigumtum. Hence on the North bank, there is no extension or alteration in the main features of the project: but the land being accurately contoured, it is found

that

that some 8000 acres can be cultivated from the channels and tanks, beyond the area for which credit has been taken heretofore - The levels have been taken over a length exceeding 200 miles. On the South bank, a line of levels has been taken from the site of the head sluice, along the proposed main channel, thro' Triculore, to the large tank called Cadumba-colum, which waters the lands of the village of Seuteraperi; then following Colonel Horsley's line, above the villages of Coorumboor and Nul-loor to the Ammenpuram tank; and on by Kanum and Manakadu, to Trichendoor, with a branch south-wards for 2 miles to Ellapanaiken puried tank - Starting from Seutira-pari again, a section has been taken, in a line parallel with the river bank, thro' Shedavygal to the Ahtoor tank, inorder to compensate the people of Ahtoor for the diminution of water in the river channel, consequent on the annicut arresting the river water in the dry season. From Ahtoor levels have been taken, southwards thro' Arumuganari to Trichendoor; while

while a parallel line has been run, from Shedungcal to Kannun, and from Kannun eastwards to Arungamari, besides the above, several cross sections have been taken between the Salt Pans and Trichendoor, over the swamp and waste lands. To the South of Trichendoor, the backwater along the coast, might, as stated by Colonel Horsley, have furnished the means of navigation to the Port of Cola-sagrapatam, but there will be no extension of cultivation beyond Ella-panaicken. Levels have been taken on the Southside over a length of 150 miles.

Colonels Anderson and Wilkieson having gone over the country; by their direction, the main channel will not be taken thro' the Cadumba tank, but will pass round the spread of the tank, and without affecting the interests of the Sentera-peri people, will be carried by an enlargement of the present high level channel (being a surplus from the Cadumba tank) to the Ammenpu-ram tank. A sluice of distribution will be required at the entrance to the Cadumba tank for the three-fold purpose of supplying that tank,

of conveying the main channel round it to the South, and of throwing off a minor channel to Ahtoor. Some 800 acres of land will be brought under cultivation by the new Ahtoor channel. The low swamps about Hailputnum cannot be drained off as their level is too low, but allow=ing for the lodgment of water there; At least 3200 acres of land about Nulloor, Arrunganeri and towards Kunnum, can be irrigated.

Thus on the South bank, the altera-tions in the project consist in a diver=sion of the main channel, round, instead of through, the Cadumba tank but to return to the same point, the Ammenpuram tank, and a new branch channel for Ahtoor, while an addi=tional area of 4000 acres will be irrigated.

The general result is, that without extending the length of main channels, and with but slight modifications of the original system, 13000 acres of new land will be cultivated, giving a return say of Rs 60,000, to be ad=ded to the Rs 40,000 already estimated, or a revenue of 1 lakh on the outlay that may now be taken at 8½ lakhs.

24 June /68 Sd H. L. Prendergast Captain
(True Copy) Executive Engineer

[signature] Wilson Lieutt Col RE
Superintending Engineer &c In

6

Enclosure in a letter No 884 dated 3rd July 1868 from the Supdg Engineer 8th Division

To The Secretary to Govt. P. W. D.

PW ~~2549~~ 4926 / 68.

Brief Statement of Survey operations carried on in connection with the Streery quartum Ancient Project

Pro: 27 Jany 1869 Lr 1498

No. 150

North Arcot District
Polloor Range Office 51
Arnee 27th June 1868

From

The Assistant Engineer
Polur Range

To

The Superintending Engineer
4 Division

Sir

With reference to your Memo No. 1448 of the 24th instant with enclosures as per margin, I have the honor to make the following report on the survey operations for the Mambankum Project, as carried on by Govindoo-row.

G.O. No. 1824 of the 15th June 1868

2. The site of the Anicut is about half a mile below where the Coilladdy drainage enters the Cheyaur, Latitude 12.25 Longitude 79.2.30 on District Map.

3. The datum line is the same for both channels i e the deep bed of river.

4. The Southern Channel runs east until it enters the Head of the Chear river 42 Miles 5 Furlongs from site of Anicut, Total fall 274.12.

5. The slope (except where the channel cuts narrow ridges on the 7th 10th 19th 21st 31st and 35th Miles) is pretty regular.

6. Eight branch channels have been laid out for the purpose of filling distant tanks, the heads of which will be on the 4th 10th 17th 18th 21st 22nd 26th & 36 Miles the agregate length is 43 Miles.

7. All these levels have been Closed on the Crown of the esxisting Annicut and they make it 2f 2. 8.5 below deep bed of river at Mamhaukum.

8. The Main channel Can be traced as follows from site of Annicut to half a Mile South of Serikallumbaddy Latitude 12.23.30 Longitude 79.6 D. M. Cuts the Polloor and Triomallee road 11 Mile from the latter town Latitude 12.23, Longitude 79.9.30 D. M. takes a North east turn and enters the North Arcot District Near Pandum, Latitude 12.26 Longitude 79.15 D. M. runs east and Cuts the road North west of Chittapett, Latitude 12.27 Longitude 79.24.30 D. M. and enters the Vellum tank which is the Head water of the Clear river Latitude 12.31.30 Longitude 79.32.11 D. M.

9. The Northern Channel is 28 Miles and one furlong long, it Crosses the Miroogunda-nady drainage at Latitude 12.26.15 Longitude 79.6.15 D. M. runs through the Polloor, Conotoor, Goodaloor tanks and ends in the Vennamunglum tank

tank Latitude 12.36 Longitude 79.21 D. M.

10. The fall is 190.08 in the whole length of the Northern Channel i e from the deep bed of the river at site of Anneut to the water spread of the Veenammunglum tank.

11. There will be nine branches from this Channel to fill distant tanks of an agregate length of 12 Miles,

12. Besides the Head Sluices for the 17 distributing Channels, 26 others will be required to fill tanks close to the line of Channel.

13. 315 Square Miles of Country Containing 158 tanks has been Surveyed and Mapped Shewing the position of each tank.

14. I have also had a line of levels taken from the Arnee river to the Cheyaur river, above present Anneut The distance is 8 Miles 3 furlongs the fall is 60.97 or nearly 61 feet between the deep bed of both rivers so that if it should be found that the present supply of water in the Cheyaur is insufficient for both Anneuts as much of the water of the Arnee river as would be required could be utilised.

15. The only information which I now require, to be able to submit the Project is the quantity of water which the river can supply and the quantity that will be required for irrigating the land under the

the 158 tanks which will be filled by the proposed work.

I believe the Village Servants have been ordered to keep a Register of water flowing down the river, but unless we Contour the whole of the tanks which will be effected by the work it is impossible to say what quantity of land will be irrigate this again would be effected by the supply of water which is most irregular, so that our labour would be thrown away I therefore suggest that the revenue Officers Concerned be Called on to furnish the Report of the increased quantity of land that Can be brought under irrigation and the average Cultivation under the tanks at present, I shall be able to submit all the Plans & Estimates within a Month from the date of receiving the information on these two points

16. The Cheyaur Channel will require double the quantity of water which it has received hitherto Consequent on the improvement and extention which is being Carried out on the Channel so I think that unless a dam is built across the Arnee river and a Channel Carried across to the Cheyaur the lower anicut will be

be starved by the proposed upper work.

55

I have the honor to be
Sir
Your most obt. Servt.
[signature]
Assistant Engr. Pollock Run

GNo 2181

No. 2323

From
The Assistant Engr.
Pillood Range

To
The Supg. Engineer
4 Division

Dated 27 } June 1868
Received }

Mrs. 5 July
No. 150

File

Reports on the Progress
made with the Survey
for the Moombaukum
Project

See the other replies
received - & put
these together

4926

P.W. ~~3202~~ /68

Pro: 27 Aug 1869 No. 498

Return to the forwarded in letter Form & let Col Mosbeely understand that in this Div. Form of Memo. from Executive officers to the Supt. Engr. is only to be adopted in matters of importance

Drafted

From

No 2350

The Executive Engineer
Chittoor Range N.A.

To

The Superint^d Engineer
P.W. 3202 / 4th Division

Dated 2nd July 1868.
Recd 7 July 1868.

No 147.

P.W. 4926/68

No 1448. 24th June 1868.
Pro: 37 Jany 1868 Lr 498

Surveyor Moopasamy Mood^r paid Rs 75 a month with a draftsman at Rs [illegible] a month and 6 lascars joined the range on the 15th July 1867

From that time till 29th February 1868 he was engaged in surveying for the supply of a string of tanks from the Panjany reservoir

to

A copy of letter may now be made for Govt.

to Palmanair.

This large reservoir was constructed by previous native proprietors immediately below the junction of 2 streams which across the road from Palmanair to Poonganoor about 5. miles North of the former place, between villages marked Kotoor and Koyalour in the printed map. The papers were submitted some time back to the Joint Secretary for Irrigation, but as the return is estimated at only 8 per cent. I fear that officer will not recommend its execution.

From 1st March to 1st May /68 he was engaged in laying out and surveying for the Civil officers a line of road from Poonganoor on the Maddanpilly road to Saddam and continued to the main Trunk road to Cuddapa; this line has been commenced as a means of employing the poor population during the late pressure.

On the 1st May he rejoined this Department and was sent to survey the valley of the Iral river, a main feeder of the Poiney river running from Kosowoorpully near its source and

crossing

crossing the Cuddapa Trunk road at Pooterput, the proposal being to dam it near the hills, and to turn its water to Rammpully and other tanks; the survey is not sufficiently advanced for me to offer any opinion as to its practicability.

59

[signature] Lieut. Colo. R.E.

Executive Engineer Chittur Range

61

Mr. Surveyor. McGrath's services in the 3rd Range. - Statement of Survey Operations

Madras District

No. 122

From The Sub. Eng. in ch. 3 Range

To The Superintending Engineer &c.

Sir.

As called for in your No. 1440 of 24 Instant, I beg to append below the operations on which Mr. McGrath was engaged upon, during his employment in this Range, which was for a period of 7 months.

Report.-

Mr. McGrath's work during the period employed in this Range, was, the Surveying of the Country, embraced between the boundaries herein under named; No. 1 Trunk Road, on the North, the Palar & Vegavathy Rivers on the South, McLean Choultry Road, and the Town of Conjeveram, on the East, and the Old head of McLean Channel on the west side.-

The Survey, merely, was made, but before the levels were taken he was

removed.-
The work as far as performed is but a small portion of a large series, and consequently far from complete. The intention of the surveys, is for projecting a "South branch" to the "Kamba Kal", which would draw off from McLean channel directly, not far from the head of this latter, so as to utilize more of its waters, which the "Kamba Kal" is not in a condition to carry away; and after serving all the large tanks, south of No 1 Road, between Damul and Lemnairy, it is intended that it should follow the line of the "Ancient South branch of the Kambakal" into the Chinglepet Valley. The survey of the latter line, having already been taken, that between the proposed point of branching, above described, and Lemnairy, was what was intended to occupy Mr. McGrath.- The restoration of the old head of the "Damul Channel" forms a part of the scheme also.-
As regards the results of the survey

63

ascertained or indicated, which the Government of India requires to be informed upon, I beg to mention, that the proposition is quite a feasible one, which is as much as I can say, with so little of the investigation executed.-

On the "Trigonometrical Map," the scheme above described, may be traced between the parallels of 79°31 and 79°46 E: Long:, and extending up to 80°10:; and between 12°45 and 12°55 N. Lat:.-

I have the honor to be
Sir
Your most obed. Servant
[signature]
Sub. Engr. incl. 3 Range

3 Range Office
Poonamallee
30 June 1865

12 No. 218

From

The Sub Engineer DPW

No. 3 Range Madras Distt.

To

The Chief Engineer

4 Do.

4926.

P.W. ~~3202~~ / 68.

Pros. 27 Jany 69 No. 498.

No 66 - 65

Supg Engrs Office 3rd D
Camp Masulipatam
1st July 1868

From

Lieutenant Colonel G. V. Winscom R.E.
Superintending Engineer 3rd Dn

To

The Secretary to Government
Department Public Works
Irrigation Branch

Enclosure
1 Plan

Sir,

In reply to G. O. No 1824 dated 10th June requesting to be furnished with a brief statement of the Survey operations that have been carried out during 1867-68 in Connection with new Irrigation Projects, I have the honor to inform you that the services of the special Establishment assigned for that purpose have been principally devoted to the developement of the large and important project for irrigation in the northern Delta of the Pennair River, in the Nellore District. These operations have been carried on under the very able superintendence of Mr R. Smith Executive Engineer, who has been assisted

assisted by 3 trained Surveyors - Mr. Berlie. Serjeant Appleby and C. Sashachellum Moodelly all of whom have pursued their work in a zealous and systematic manner, with which I have every reason to be satisfied -

2 The general scope of the project may be thus stated -

The Anicut at Nellore only insures the irrigation of the Southern Delta of the Pennair - With the exception of small channels taken off to some of the principal tanks, the Northern Delta has been neglected. Including the lands adjoining the Delta an area of not less than 150000 acres may be Com:mand by a Channel taken off at Sangum, but the whole of this is not available, 1st on account of much land being retained for Villages Topes &c and 2nd on account of the limited supply of water obtainable Mr Smith has taken the worst year/1863/ of which there is record, as his guide in calculating the water available and in planning all his

Enclosure 1 Plan

6

Channels and Masonry Works. With every deduction made, 80000 acres can surely be watered annually on the North of the Pennair. The plan[+] I send will I conceive show the boundaries of the irrigable area better than I can describe them in writing. Mr Smith reports as follows:-

+ Requested to be returned

5 "The lines for the Main Channels" "have all been decided on, and most" "of them have been set out, surveyed, and" "levelled. Preparatory to staking out" "the Channels, an accurate outline of the" "Country was obtained by numerous" "Sections[+] taken from different points," "on the left bank of the Pennair, across" "the main watershed, to the Pydaree," "North of this River also a series of" "levels have been taken to ascertain" "the Elevations and depressions in" "that locality. A Survey of the Kanigerry" "Tank showing the present and" "proposed Capacities has been made;" "the Durmee and 4 other Minor Reser:" ":voirs have also been surveyed".

+ Classed as "Initial levels" in the Epitome.

Subjoined is an Epitome of the

"the principal work done—"

Channels set out and Surveyed	Detailed Longitudinal & Transverse Sections of Channels	Initial Levels	Miscellaneous Levels	Tanks Surveyed	Tanks partially Surveyed	Remarks
Miles	Miles	Miles	Miles			The levels have all been reduced to Mean Tide.
105	186	281	121	8	18	

"6. From the available information"
"it is evident the Project will be a"
"remunerative one, but to what extent".
"I am not prepared to state as the"
"detailed Estimates, of the Cost of the"
"Works, have not been framed; I think"
"however a return of 10 per Cent may"
"be Confidently expected, and if the"
"water rate is increased from Rs. 4 to Rs 5"
"per acre as has been proposed[x]"
"for irrigation under River Channels",
"in Mysore, a very handsome profit"
"would be the result."

[x] Judging from a report published in the "Madras Times" a few months ago.

3. Another scheme that has been taken up systematically is one for irrigation from the Muniar a tributary of the Kistna. The Surveys & levels have been well carried out by

69 26

Surveyor Haimsing - Probably about 15 or 18000 acres will be supplied - but no register of the River having been kept in past years I am not yet in a position to submit the project to Government -

4. Captain Smith R.E. was employed for about a month on a project for supply of water to Dondapaud Tank near Vinconda, which he labored at with zeal - but being attacked by the virulent fever that prevails in that portion of the Country he had to proceed to England before his plans were fully matured - I hope however that during this year something definite in the matter will be decided on. At present there is doubt if the irrigable land under the tank is sufficient to repay the cost of its restoration.

I have the honor to be
Sir
Your most Obt. Servt.
Geo. T. Winscombe(?) Lieut. Col. R.E.
Superintending Engineer 2d D.

AM

No. 222

20

P.W. 1868 Dept.

From No. 2555

The Superintending
Engineer 2d Division

To

The Secretary
to Government D.P.W.
Irrigation branch
Madras.

Dated 1st July 1868
Received 6 " "
No. 44 Encl. 1.

Report shewing the
Progress made in
the investigation of
irrigation Projects
in the 2d Division
during the past year

P.W. 4926/68.

~~Proc 27~~ - Aug 16 ~~[illegible]~~ 498

73

Memo

Mr. McGrath surveyed the Kuam and old Bungaroo Channel between Kesaveram and Korattoor Dams, and the position of all Channels taken off the Kuam, within that limit, for irrigation.

Object of the work. — To ascertain the position of the obstructions in the Kuam between Kesaveram and Korattoor Dams, but as no levels were taken by Mr. McGrath, the result has not been ascertained, however arrangements have been made to take Longitudinal and Cross sections, and when completed a report

will

be submitted on the general results ascertained

J. H. Gordchap Assistant Engineer
In charge No. 1 Range

D. H. 1926
3 Expg / 18.

1/24 3/0 / 68

No. 336

15 P 43

Supg Engineer's office 6th Dn.
Trimady 1st July 1868

From
Captain R. F. Oakes R.E.
Supg Engineer 6th Division

To
Colonel C. A. Orr. R.E.
Secretary to Government
D. P. W.

Sir

With reference to G. O.
No. 1824 of the 10th June 1868. I
have the honor to state that no
survey operations for the
investigation of new Irrigation
Projects have been undertaken
in this Division.

I have the honor to be
Sir
Your most obdt Servant

R. F. Oakes Captain R.E.
Supg Engineer 6th Dn.

P.W. 1868. Dept

No. 2507

From
the Supg Engineer
in NW 149 6th Dn
To
The Secy to Govt
P.W.D.

Dated 1st
Recd 4th } July 1868 –
Regd 16th Oct 68

No. 336 –

Transferred from
the Secy's Depty
16th Oct – 68

P.W. 4926/68

States that no Survey operations for New Irrigation Projects have been undertaken in the Division –

No. 118

Camp Chembrambakkam Tank
2d. July 1868

77

From

The Assistant Engineer
In charge of the Chembrambakkam Tank

To

The Superintending Engineer
4th. Division ~~Madras District~~ /

Sir

I have the honor to report with reference to your Memo No. 1448 dated the 24th. June 1868 Calling on me conjointly with the officers incharge of No. 1 and 2. Ranges to report on Mr. Mc. Grath's Operations while employed as Surveyor that Mr. Mc. Grath made a Survey and Section of the line from the head of the Goodapakam Channel to the "Namum" Calingulah which Section the line being abandoned as a Supply Channel I have not Checked so I cannot say if its is Correct.

I beg to enclose a memo of Mr. Mc. Grath's work while employed under Mr. Goodchap received from the latter officer. Mr. Ottman has not communicated with me on the subject I have delayed this report for some days thinking he might do so, now as the G. O seems pressing I forward all the information in my possession as probably Mr. Ottman will have sent his direct.

I have the honor to be
Sir
Your most obedient Servant
R L Sowry
Assistant Engineer in charge of the
Chembrambakkam Project

15 P.W. 3202/68
From ~~No. 1/6~~

The Asst. Engineer
In charge of the
~~Ch~~ ...karambake
Tank or No. 7 Ra[illegible]

To
The Dep. Engineer
4th Division

Put up their
answers to
complete

Dated 2d July 1868
Recd 10/5

A.B. 12th

P.W. 4226/68
Reports on Mr. McG[illegible]
proceedings while
employed under the
actg Asst Engineer
and forwards the
Asst Eng. Charge of
No. 1 Range's minute
on the same
subject

2181

Return for
endorsement
B

79

Statement shewing the work performed by Surveyor C. Vadanthachary in the investigation of the proposed Seear Annicut Project in the Madras District from the 1st November 1867 to 20 April 1868 as called for in the Superintending Engineer's Memo No. 1448 d/24 June 1868.

Square Miles of Country surveyed on South bank of the Cheyar shewing position of Tanks and Channels therein with Calingulah levels of each Tank & Contour of water spread	Square Miles 150
Longitudinal levels taken of main Channel & its branches	Running Miles 85 3/4
Add do taken in Polūr Range N. Arcot Distt.	(To be filled up in the Supg Engrs Office)
Total	
Length of Cross Sections of Cheyar River	2 1/2
Add Do taken in the Polūr Range North Arcot District	(To be filled up in the Supg Engrs Office)
Total	
All the above work plotted and coloured on plan to scale	~~1/5280~~ 1/10560

N.B. Surveyor Vadanthachary's work in detail was sent to the Supg Engineer with the Executive Engineer's letter No. 15 d/ 23 April 1868.

There are no records in this Office to shew what length of Longitudinal & Cross Sections were taken by Vadanthachary in the Polūr Range N. Arcot Distt. They will be found in the Supg Engr's Office from Surveyor Vadanthachary's Progress Reports sent thro' the Polūr Range Officer.

R. H. Leggatt
Executive Engineer
No. 4 or Chingleput Range

14

1/2954/68

P.W. 4926 ~~3202~~/68

Pres = 27" Jan 1/69 L. L.498.

81

Statement shewing the work performed by Mr Surveyor S. H. Adolphus in the investigation of the proposed ~~Cheyar~~ Seyar Anicut Project in the North Arcot District, from the 1st February 1867 to 31st May 1868, as called for in S.E. Memo. No 1448 dated 24th June 1868.

Square miles of country surveyed shewing position of Tanks & Channels therein, with cubical levels of each Tank and Contours of water spread — 98 Square miles

Longitudinal levels of main Channel from Anicut and subsidiary existing Channels from River Seyar — Lineal miles 94

Length of cross sections of River Cheyar, Calaway Madoogoo, and old Nabob's Channel to Doosy Mamundoor Tank — 42

All the above work plotted and coloured on plan to scale $\frac{1}{4800}$

B. B. Leggatt
Executive Engineer
4th or Chingleput Range

W. H. B. Robinson(?) Lieut.
Asst. Engineer
Vellore Range

33

P. W. 3202/68

P. W. 4926/68

Tros. 27. Jany/69 La 2498.

No. 119

Chembrumbaukum Tank
2nd July 1868

From

The Asst. Engineer
In charge of the Chembrumbaukum Tank

To

The Superintending Engineer
4th Division

Sir

In accordance with the instructions contained in your Memo No. 1448 dated 24th June communicating the proceedings marginally noted I have the honor to report that shortly after taking over charge of the chembrumbaukum Tank project. I found that thro an oversight a very serious mistake had been made by which if the plans were carried out as originally designed a large vally containing some 2000 acres of very valuable land and three large villages would be submerged The supply channel from the Cooum which also received the surplus from the Namum Tank passes through a high ridge before entering the Chembrumbaukum Tank and the contour lines on the plan of the latter are shown as crossing this supply channel at or nearly at right angles whereas they should have followed up its bed into the valley mentioned above

Pro of the Supreme Govt. No. 721 dated 19/5/68
G.O. No. 1824 dated 10th June 1868

When reporting the state of matters to the Superintending Engineer I expressed an opinion that the mistake might be remedied and in the G.O. noted in the margin. I was authorised to submit plans and an Estimate for what I proposed In carrying out these orders

No. 1275 dated 27/4/68

orders the following Surveys and Sections have been made and taken.

1_ Survey and Section for a supply Channel

2_ A line from the Namum Tank to the Chembrum:bakum Tank.

3_ A Survey and Section of a line from the Namum Tank through the Goodapaukum Tank to the head of the Supply Channel from the Cooum for this last named Tank.

4_ A Survey and Section of a new Supply Channel from the Cooum River to the Namum Tank.

5_ A Survey and Section of a Channel to drain the valley of the old Supply Channel.

The total length of the lines Surveyed and of which Sections have been taken is 26½ miles But I need hardly mention that this does not cover half the distance gone over as several trial lines had to be projected and given up in each instance before finally deciding on the one to be adopted

I have the honor to be
Sir
yours obedient Servant

R. S. Lowry.
Assistant Engineer
In Charge of the Chembrambaukum Tank

88

4926

From No. 2341

R. I. Lowry Esqr.
Asst. Asst. Engineer
No. 7th Range
Madras Distt.

To P.W. 3202/68

The Superintending
Engineer 2nd Division
D.P.W.

Dated 2nd } July 1868
Received 5th }

4926

Enclosures none

Report on the progress
made in Surveying
Levelling and Revising
Chembrambakum Project.

P.W. 4926/68.

2181.

Pros. 27th Jany /69 No. 498.

No. 71. 87 Supg. Engrs. Office, 5th Dn.,
Salem, 18th July 1868

From

The Superintending Engineer,
5th Division

To

The Secretary to Government
Department of P. Works.

Sir,

With reference to the order of Government of the 10th of June No. 1824, I have the honor to state that the following surveys, connected with new irrigation projects, were made last year.

(1) Survey of the tanks to be supplied from an Anicut, proposed to be built across the Manimootar river, about ten miles West of Virdachellam, in the South Arcot District. The tanks 8 in number are at present supplied by a narrow and tortuous channel, close to the river. Levels have been taken for a new main channel and branches.

The estimate for anicut, head and division sluices, and channels amounts to Rs. 54,800 and the expected increase of Revenue is Rs. 11,420 from 2178 cawnies

1 Cawnie = 1.3 acre

of

of land which are to be brought under wet cultivation. The Survey was made by Cooppoosawmy, the draftsman of the 4th Range Office, under the direction of Mr R. E. Norfor Acting Executive Engineer.

(2) Another survey made in the same range, was for an anicut to be-built across the Myore Nuddy, about 3 miles due West of the 135th mile of Trunk Road No. 8 (14 miles West of Virdachellam) with channel for the better supply of about 240 Cawnies of land. The expected increase of Revenue in this case is Rupees .... and the amount of the estimate for anicut channel &ca is Rupees 10,770.

(3) In the Villupuram taluq, a survey was in progress for a new head to several of the channels on the North bank of the Poonar. Levels have been taken from the North main channel of the Poonar anicut, which is about four miles East of Trikalore. The Survey has not yet been completed.

(4) In the Trinomalay taluq a survey was made, and levels taken, for a supply channel, from the Cheyar river to the Samoodram tank, near

Trinomalay. The estimate amounts to Rs. 6,200, and it has been laid aside for the present, as there are doubts of the sufficiency of the water that can be spared for this tank.

This survey and the one in the Villupuram taluq have been prepared by the Taluq Overseers without any extra charge for Surveyors or Draftsmen.

/5/ In the Salem District, a survey has been made of the Bada Talah a tank near Kristnagherri, and levels have been taken for a channel, about 12 miles in length, for its better supply from the Pendar river.

The cost of enlarging the tank, cutting the channel, building an anicut and subsidiary works is estimated at Rs. 59,600 and the expected increase of Revenue is Rs. 11241.

The estimate and plans have been forwarded to the Collector for his countersignature. They were prepared by the Taluq Overseer under the direction of Mr. L. W. Paynter, Assistant Engineer.

I have the honor to be
Sir,
Your most obd: servant

E A Ford Lt. Col: R.E.
Supg. Engineer, 5th Dn.

P.W. 1868 Dept

From No. 2757

The Superintg. Engineer
5th Division.

To

The Secretary to
Government
D.P.W.

Dated 18th }
Recd. 20 } July 1868.

No. 71.

P.W. 4926/68.

Report on the Survey operations that have been carried out in connection with new irrigation projects, in South Arcot & Salem

Pros: 27th Jany 69 In L. 498.

No. 102

Supg: Engineer's Office 7th Division
Coonoor 18th August 1868

91

From

Colonel G. W. Walker R.E.
Supg: Engineer 7th Division

To,

Colonel C. A. Orr R.E.
Secretary to Government D.P.W.
Madras

Sir,

I have the honor with reference to G. O. No. 1824 of 10th June, to report that the Survey operations connected with the Nerinjepett Annicut and Channels project have been carried out by Mr. Sub Engineer Wiffen and the Survey party placed at his disposal in G. O. No. 1,183 of 17th April 1867, to the following extent, viz:-

2. On the Coimbatore or right bank of the River Cauvery for 41½ miles, extending from Myladigoondoo the site of the proposed new Annicut over the Cauvery, 4½ miles above the site of the old ruined Annicut at Nerinjepett, to the Bhowany River 6 miles above its confluence with the Cauvery. The exact site proposed for the Annicut can be best identified on the Survey Map of India by the Village of Nagapatti marked thereon, 2 miles below which it is. In the space included between these 2 Rivers, according to the Revenue Statements there are about 9000 acres of land capable of conversion from Dry into Wet.

3. On the Salem side owing to very frequent interruptions from the ill-health of

of those employed, and due to the very feverish nature of the Cauvery Valley, the line of Sur=
=veys has not been fully carried out, or the extent of cultivable area ascertained. It will have to be limited to a certain extent by the existing demands for water in Tanjore.-

4. Mr. Wiffen and myself have personally conferred with the Chief Engineer for Irrigation on the details of the work, and are to meet him again in September on the spot with all the papers complete as far as possible with a view to the entry of the project in the Budget of 1869-70.-

I have the honor to be
Sir,
Your most Obdt. Servant.
G. W. Walker Col. R.E.
Supg: Engineer 4th Divn.

P.W. 1868 Dept.
No. 3210.
From
The Supg: Engineer
4th Dn.
To
The Secy. to Govt.
P.W.D. - Madras
Dated 18th August 1868.
Recd. 22nd — " —
Enclosures No 102
Reports how far the Surveys connected with the Cauvery project Channels have been carried out by Mr. Wiffen and his survey party.-
P.W.D. 28/68
Pro: 29 Jany '69 No 1458

Special Executive Engr's Office
Wynaad Luckadie
No. 444 19th August 1868

93

From

The Special Executive Engineer
Wynaad

To,

The Secretary to Government D.P.W.
Fort St George

Sir,

With reference to your G.O. No. 1824 dated 10th June 1868 - I have the honor to state that no survey operations in connection with the new Irrigation projects have been carried out in my Division during the working season of 1867-68.

I have the honor to be
Sir,
Your Most Obedient Servant

Robt. B. Kerr Captain
Spl. Exe. Engineer Wynaad

P.W. 1868 Dept.

From — No. 3211.

The Special Exd Enginee[r]

Wynaa[d]

To

The Secretary to Govt.

W P W

Fort St George

Desp. 19th }
Recd. 22nd } August 186[8]

Enclos: none

No. 444

P.W. 4926/68

States that no survey[ing]
operations in connection
with the Irrigation projec[t]
have been carried out i[n]
this Division during 67-6[8]

Pros. 27 Jany /69 No. 2498

Memorandum of the probable cost of the Roddum Project.

Annicut	Rs	40,000
Head Sluice		3500
5 Waterweirs		4000
10 Drainage inlets		900
1 Aqueduct		400
Cholamary tank raising Calingulahs 2 feet and building a Sluice		500
9¾ Miles 152 yards of Channel 33×5 ft. @ 8 6 yds per Rupee		39,660
Sundry stone revetments		2000
Tamping in rear of do		300
		91260
Other charges		9126
	Rupees	100,384

If we add 25 per cent to this cost would be = 1,25,000 & as return is 9,200 it would be about 7½ per cent. deducting 2 per cent for repairs & shews a gain of 5½ per cent.

(Initialed) A. S. M.

Revenue to be derived from Tank taken from documents dated 1862 (copy of late Revenue information from Penna[illegible] not furnished)

Roddum Tank	Rs	4571
Nullore		448
Cholamary		1788
Cullapy		2002
Cottapully		395
	Rupees	9204

Rupees 9204 = 8.17 Per cent on expenditure.

Bellary
27th November 1868

(Signed) J. Gray Dyt Comy
Assistt Engineer 2d R.

(True Copy)

[signature]
Major R.E.
Supdg Engineer 3d Division

P.W. 4926/68

Pros: 27th Jany 1868 £498

Memorandum of the probable cost of the Roddam Project.

No. 2432. Sup. Engr's Office 4th Dn.
Madras 26 August 1868

From,

Colonel A. J. M. Boileau R. E.
Superintending Engineer 4th Dn.

To,

Colonel C. A. Orr R. E.
Secretary to Government P. W. Dept.
Fort Saint George

Enclosures
2 Maps
7 Reports

Sir,

With reference to G. O. No. 1824 dated 10th June 1868 I have the honor to subjoin a brief sketch of the survey operations carried on in this Division in connection with new irrigation projects.

Palmanair irrigation project. - Surveyed by Cooposawmy Moodelly. The object is to secure a supply for a string of tanks from the Panjairy reservoir to Palmanair. "The large reservoir was constructed by previous native proprietors immediately below the junction of 2 streams which cross the road from Palmanair to Poonganur about 5 miles north of the former place between the villages of Kotoor and Koyalur." A return of about 8 per cent is expected.

Irál project. Is being surveyed by the same Surveyor. The Irál river is a feeder of the Poiney river and runs from Kosoowoopully and crosses the Cuddapa Trunk road at Pooterput. The object is to dam up the river near the hills and

and to turn its water to Nampully and other tanks. The Survey is not sufficiently advanced to admit of a correct opinion being given as to its results -

Mambaukum project. - Survey operations carried on by Govindoo Row under the orders of Ensign Assistant Engineer Bevan - About 117 square miles of country surveyed and mapped - The site of the proposed Anikat is about half a mile below where the Coillady drainage enters the Cheyaur N. Lat: 12-25 E Long: 79-2-30. The Southern Channel runs east until it enters the Kilear river 42 5/8 miles from site of Anikat. Eight branch channels aggregating in length 43 miles are to be excavated - The main Channel runs from site of Anikat to half a mile South of SeriKallumbady N Lat: 12-23-30 E Long 79-6 cuts the Polloor and Trinomallee road 11 miles from the latter place N Lat: 12-23 E Long: 79-9-30 then takes a North East turn and enters the North Arcot District near Prandem Lat 12-26 Long: 79-15 - then runs east and cuts the road North West of Chittapet N Lat: 12-27 E Long: 79-24-30 and there enters the Vellur tank N Lat: 12-31-30 E Long: 79-32-11 - The Northern Channel which is 28 7/8 miles long, crosses the Miroogondanaddy drainage at Lat: 12-26-15 Long: 79-6-15

runs

runs thro' the Polloor, Cunatoor, Goodaloor tanks and ends in the Vinnamungalum tank. Nine branch channels of an aggregate length of 12 miles will be excavated to fill distant tanks. The object of the project is to supply water to 158 tanks. The information required to complete the project are the quantity of water the river can supply and the exact quantity of land that can be brought under irrigation.- The grand flaw in the project is that it will cut off the small feeders from the existing irrigation

<u>Cheyar New Anikat project</u>.- This project is spread over parts of the North Arcot and Madras Districts. The portion on the North bank of the river is being investigated by Mr. Surveyor Adolphus- About 98 square miles of country have been surveyed and plotted, and 94 running miles of longth. levels and 42 miles of cross sections taken.-

The portion of country on the South bank of river measuring about 120 square miles was surveyed, and the levels were taken by C. Vadan-tachary-

The scope of the enquiry is to see if the waters of the Cheyar which are very abundant and which run to waste thro' the Palar into the Sea could not be utilized by throwing an anikat across it. It is expected that about

about 138 tanks, 30 in the Arcot talug, 38 in that of Wandiwash, and 70 in the Chingleput Range will be benefitted by the execution of the project.

Its position is shown in the trigono-metrical map accompanying.

"South branch to the Kambankal" - Partially surveyed by Mr. McGrath under the orders of Mr. Sub Engineer Ottmann. The country embraced by the project is bounded on the North by No. 1 Trunk road, on the South by the Palar and Vagarathy rivers, on the East by McLean's Choultry road, and the town of Conjeeveram and on the West by the old head of McLean's Channel, and lies between the parallels of 79-31 and 79-46 E. Long: extending up to 80-10 and between 12-45 and 12-55 N. Lat:

The intention is to excavate a South branch to the Kambankal for carrying off more of the water of McLean's Channel than the Kambakal is in a condition to do to supply all the large tanks South of No. 1 road between Damul and Ternainy and further on.

Kiram River and old Bungaroo channel. - The portion between Kasaveram and Korattur

Dams

Dams surveyed by Mr. McGrath and the position of all Channels taken off the Kuam within that limit for irrigation. The levels have not yet ~~being~~ been taken to ascertain what obstructions escist in the Kuam River between Kasaveram and Koratoor Dams.

<u>Chembrumbaukum Project</u>.- When this project came to be escecuted it was found that a serious mistake had been committed and that if the original design were adhered to a large valley containing some 2000 acres of very valuable land and 3 large villages would be submerged. The project had to be reinvestigated in the course of which a great deal of surveying and levelling work was done. A new supply Channel has been determined upon which will ~~obviate~~ prevent the submersion of the lands and villages referred to, and operations which were stopped during enquiry have been, commenced pending the submission of a revised estimate for the project.

The

The positions and extent of the several projects are shown in the trigono-metrical maps enclosed. –

I have the honor to be

Sir

Your most obedient servt.

F. Boileau Colonel R.E.

Supg. Engr. Lr. Dn.

P.W. 1868 Dept.

From No. 3202

The Supg. Engineer
& Dn

To

The Secy to Govt P.W.D.

dated 20th
recd. 22nd Augt. 1868

No. 2432.

Enclos: 10

P.W. 4926/68

Subjoining a
brief sketch of the
Survey operations
carried on in the
2 Division in
connection with
new Irrigation
projects —

Pres: 27th Jay 1869 to L 498

No. 1925.

Supdg. Engrs. Office 3D.
Belgaum 28th Aug 1868.

105.

From
The Supdg. Engineer
3rd Division.

To
The Secretary to Government
P. W. D.

Sir,

Enclosure

With reference to G. O. No. 1824 of the 10th June 1868, I have the honor to submit the accompanying statement shewing what progress was made up to the end of June in the investigation of the several new irrigation projects in this Division.

I have &c.

A. Kittoe[?] Major R.E.
Supdg. Engineer
3rd D.

P.W. 1868-9. Dept

No. 3342.

From

The Supdg. Engr.
3rd Dn

To

The Secy. to Govt.
P.W.D.

Dated 28th Augt. /68.

Recd. 2nd Septr. —

Enclo. 1

No. 1925

P.W. 4926/68.

Forwards a Statement shewing the progress made on several new irrigation Projects in the Division.

Pros. 24th Jany /69 No. 498.

1

SP 16 14

Preliminary Report upon proposed Irrigation Works in North Ganjam

The principal physical feature of North Ganjam is the Rooshkoolia - this River rises in the Khond Hills above Goomsoor, near Aska it is joined by the Mahanuddy with a Stream larger than its own also flowing from the Eastern Ghauts 5 Miles lower down the Jonaye falls in on the left bank and 10 Miles below Aska the Stream is augmented by the Godahallow flowing in on right bank from the Range of Hills situated to the west of the Military Station of Berhampore; the Rooshkoolia enters the Sea at Ganjam formerly a most flourishing Port and Chief Civil and Military Station in the Northern Circars still a place of Considerable trade but shunned both by Europeans and Natives on account of its unhealthiness. the Causes of Sickness are happily removeable and as no other place in the vicinity possesses Equal Natural Suitableness for trade, Not much will be done towards improving the District before it will became evident that works must be undertaken to restore to Ganjam its

its former supremacy over the numerous small ports dotted along an extensive line of Coast.

2. The Basin of the Rooshkoolia Comprises an area of 2400 Square Miles of which perhaps 1,000 Square Miles is mountainous the remaining 1,400 Square Miles Consisting of undulating ridges and Valleys broken by numerous isolated Hills Composed for the most part of gigantic gniess and granite boulders, in this large area is Contained the Government Talugs of Berhampore and Poornsoor and Zemindaries of Daracotta, Ataguddah Cullycotta, Beridi, Shargadah, Coorla and Kimedy.

and table land

2. Elevated undulating table land

3. The people subsist principally upon rice and on the success of the rice Cultivation the general welfare of the District depends, the Cultivation of Raggy has been of late wisely increased, some of the Ryots being warned by the last famine not to depend entirely on their rice fields for support, Gram and Oil seeds are grown on the highlands No Cholum is grown, this is the regretted as it requires but little rain is more nourishing than rice and for Cattle both grain and stalks Constitute Excellent food, Sugar Cane gardens are very numerous and great trouble and Expense is lavished on its Culture

I have always understood that the Ganjam Dist. exported all the rice it produces & imports inferior grain from Cuttack.

4. The entire rice Crop is dependent upon

the

the Local rains, a Considerable portion receiving little more than what actually falls upon it, the best rice ground is imperfectly irrigated by Natural drainages and hill streams the supply of water being somewhere supplemented by means of Small Tanks mostly without Sluices or Calingulahs but very useful in Enabling large areas of Cultivation to tide over a short Cessation of rain; of important tanks or river Channels the District is all but destitute, there are I think but two irrigation works that would in the Bellary District yield Rs 500 Revenue; under these Circumstances the yield of grain on the uplands is at the best but scanty, in favourable years fair Crops are obtained in the valleys, during average seasons the ryots after much anxiety have to mourn over the Crops lost and make the most of those saved; in bad years nearly the whole Crop is lost and a Scarcity or famine of greater or less intensity results-

5. The Sugar Cane though often injured by drought is seldom altogether lost, the gardens being usually close to the River and receiving from the Villagers every Care and attention the total Cost of Cultivating an Acre of Sugar appears to be about Rs 150 and its value on the ground

ground about Rs 200.

6. The District is tolerably well off for roads but difficulty is experienced in keeping them in repair no good gravel being obtainable the rocks being almost exclusively felspathic, the draught Cattle are nearly all agricultural Animals very small and weak indeed I have not seen a single bullock here fit to be yoked to a Cart; buffaloes are much used for drawing bandies they are not adapted for the work being very slow and soon knocking up in the sun when unable to bathe or wallow in the mire, the introduction into the District of a better breed of Cattle and of Cholum to feed them with is most desirable and should receive attention -

7. The general Condition of the District must I think be pronounced unhappy and such as to demand amelioration. the prevailing Custom of growing rice upon lands depending solely on the rains for irrigation must always be a source of Anxiety to the people and to Government and must produce famines periodically perhaps the oftener now, that high prices and other Causes have given a great impetus to the export grain trade; the soil is rich and fertile, there

there is little barren or stony land - the hills rising abruptly from the plains; the rain fall is very large though not excessive, and though variable never appears to fail; all parts have short easy access to the Sea; but notwithstanding all these advantages Kurnool and much of the Bellary District evince signs of far greater prosperity than Pooyam; doubtless much of the squalor and wretchedness observable around is due to the apathetic character of the Ooriahs and one great argument in favour of large Public Works is that through them the people would be trained to labour and their indolence gradually overcome.

8. But though appearances might lead one to form a contrary opinion undoubtedly the general welfare of the District has advanced considerably during the last 12 years, the Revenue has risen from Rs 15,74,143 to Rs 27,29,045 the increase being chiefly obtained from larger Salt sales, the trade in this article still admits of further expansion in much of the increase of Rs 9 lacs Revenue in from this source during the last 12 years is attributable to the formation of roads and it can hardly be questioned that the few lacs in expended

Vide Famine Report Page 6.

Expended on Communications between the Coast ×
and the interior have yielded Cent per Cent
through the Salt trade alone; the recent famine
has of Course seriously Checked this progress
and the recurrence of Such Calamities Can
hardly be prevented Except by very Extensive
Irrigation works - the people are naturally dis=
=inclined to change their ideas on agriculture
and grow other Crops on land specially prepared
for rice, in such a manner as to represent a Capital
of at least a Million sterling; the importance of
Irrigation works in this District must be measured
not only by the prosperity they will induce but also
by the Misery and loss they will prevent, the
immediate Cost to Government of the late
Famine was Estimated by Mr. Gregg Madras
Civil Service at 6 lacs of Rupees but this
did not include loss by decrease in Consumption
of Salt and Many other indirect and remote
losses such as a permanent rise of nearly 20 per
Cent on labour upon Public Works, a rise due
not to any wholesome Cause but to the worst
of all possible Causes death by Starvation
of the labourers, we should probably very
Considerably

Considerably under Estimate loss to Government of late Famine in setting it down at 10 lacs.

9. Whilst Considering Ganjam Famine years it is quite necessary to bear in mind that a Rain fall there Constituting a year of drought would in most parts of India be regarded as ample, I have no reliable data of Rain-fall previous to 1863 and probably the accom=panying register does not include a very wet year when the average fall over the District might reach 60 inches, a fall of 46" is sufficient to insure a satisfactory season if distributed over both monsoons, in the so called years of drought 1864 & 1865 that preceded the last Famine, the Register shews falls of 33.5 & 31.2 respectively in both years especially in the latter the is deficiency is mostly accounted for by the failure of the October's rains. i.e the North East monsoon a perusal of this Rain register affords us two important facts Vizt. that in the worst years sufficient rain falls to fill tanks or Reservoirs ordinarily well situated, and Secondly that rice Crops would be safe under Reservoirs holding in reserve as little as one months supply

supply of water.-

10. That nearly all the irrigation works fail to alleviate the general distress during Famine years is due to their insignificant dimensions, and also being intended for ordinary years in very bad seasons a small tank capable of saving 50 acres of paddy is rendered entirely useless by water being drawn off for 100 acres until the tank is empty. The only two important works in the neighbourhood that I know of and to which I have alluded to have answered perfectly (1) The Koratholy Tank an old work is fed by a channel from the Podahallow which has recently been improved and a weir thrown across the river; the crops under this tank have never suffered, no remission on a Revenue Rs 15,000 has ever been made; and the ryots during bad years make very large profits (2) The Boary Reservoir was constructed by the British Government in the year 1861 at a cost of Rs 10,749 the total area deriving water from this tank is 1,632 acres paying

a

a Revenue of Rupees 10,172 an increase of Rupees 1,845 on the old revenue due to a water rate of little more than one rupee per acre the average yearly repairs amount to Rs 70. so that 17 per Cent is derived upon the original Cost of Construction, the lands under it had an ample supply of water during the Famine Year and there was no remission of rent or water rate..

11. The most remunerative manner of laying out a few lacs of Rupees would probably be to Construct several Reservoirs in well chosen sites and trust mainly to Existing Channels for distribution of the water, but to irrigate Extensive areas by means of Reservoirs long and Expensive distributing Channels must be Excavated and this being the Case, it is obvi=
=ously wise and Economical to lead them from or through the principal Rivers from which throughout a great portion of the Irrigating Season they will Convey water that has not
undergone

[In]formation [illegible] as to the general character of the supply of the Rivers whether the freshes are short, sudden, or whether there is a constant stream from June to Oct. inclusive

undergone the expense of storage and which would otherwise flow unheeded to the Sea, the Reservoirs being drawn upon when the River supply begins to fail. I Consider also that any Channel that will for many Months in the year Consecutively Convey a large body of water should if possible be made Navigable. Irrigation works alone though they will afford sufficient food for the people will not unaided by Railways or Canals Civilise the Country nor awaken the minds of the Ooriahs from the wretched apathy that now debases them, neither will the waste lands be taken up nor any land properly Cultivated so long as there is a Constant demand against the agricultural Cattle for draught work; much of the rice Crop that is this year lost would have been saved had it been planted a Month Earlier which it would have been had not the Ryots been tempted to hire out their Cattle to the very last moment that appeared to give them time for ploughing.

12. In a Country like Pooyam where the natural supply of water is almost, though

indubitably

indubitably not sufficient for irrigation, water artificially stored is unquestionably of the highest value. In the Godavary where the soil is not more fertile than here an acre of land pays Rs 2 kist and 4 for water and it is universally admitted that this total rent of Rs 6 is very light and might well be increased to Rs 10.+

Govt. Ryots are already over weighted in their competition with the cultivators of Zemindars & Inamdars holdings to whom Govt. supplies water gratis.
+ Govt. thinks so. [illegible]

In Pargain the kist levied is as follows.

On Artificially imperfectly irrigated land Rs 2-15-4
On wet lands depending on local rain Rs 1-14-7
Dry Land - - - - - - - - - - - - - Rs 1-5-9

But we may assume that land thoroughly irrigated and fertilised by River water would bear a total charge of Rs 6 per acre and that land irrigated to a less degree could afford to pay Rs 3. / Communication through the Country being improved; the Channels in the Godavary are now usually made so as to discharge a maximum of 2 Cubic yards per hour per Acre for the land they irrigate, but for many years Sir A. Cotton's rule of 1 Cubic yard per Acre was followed and generally found sufficient 2 Cyds only being required at the Commencement

? was not this always reckoned on the gross area measured off a map -

of

of the season just to enable all the fields to be
planted and ploughed at the same moment.
I believe in the Godavary Delta 1½ yards
per hour per acre to be sufficient for a Channel
to Convey and that here where the Rain fall
is much greater and the Configuration of the
Country so favourable to irrigation by drainage
a Channel need only be required to be of a
Capacity to discharge ¾ C. yds. per acre per
hour and that with this quantity supplied when
wanted Crops will reach perfection — x?

13. The Irrigation scheme I propose Consists of
Channels Contoured on as high a level as is
Convenient down either slope of the valley of the
Rooshkoolia leading from weirs built across the
Mahanuddy and Rooshkoolia during moderate
weather these Channels will Convey the River
water direct to the fields during wet weather
they will fill the small tanks lying below and
when the water in the Rivers falls low will be
supplied by Reservoirs from above; My obser-
=vations and levels have hitherto been chiefly
directed to the right bank and Doab. the
guiding

The reservo[ir] will compl[...] question [...] would [...] small[...] [...] filling [...] filled [...] once [...] of a se[...] [...] Engl[...]

guiding difficulty in Contouring this Channel is the obstacle offered by a Considerable mass of Hills situated between Aska and Sujelly approaching so close to the Rooshkoolia that the upper part of the broad valley of the Podahallow Could not be reached by working round on that side Except by a very long and difficult route and not then probably without serious loss of level; we are Consequently forced to enter on the Podahallow through a ridge joining the Aska to a still higher Range of Hills, the summit level of this ridge is M. S. L + 200 ft by Constructing a weir on the Rooshkoolia immediately below the Confluence of the Janemelly Nullah upon a granite barrier there met with, its Crest being level with Highest Flood Line or M. S. L + 175 ft and allowing a fall of 6 inches per mile, the Cutting under the summit level will not Exceed 30 feet + 5' depth of Channel say 35 feet; from the Rooshkoolia weir I would lead a Channel to the Mahanuddy below the Confluence of the Barata Nullah and there place a weir with Crest up to level of Highest flood or M. S. L + 183' so that this Channel primarily intended to supplement the supply in the Rooshkoolia would have a fall of 8 feet in 17 Miles; between the two weirs a somewhat formidable Cutting appears necessary which

The whole fall to [illegible] water would not be less than 8½ feet per mile on the average. The [illegible] works or those not [illegible] for irrigation along would be a tremendously heavy addition to the cost.

which further Exploration may possibly shew may be avoided..

14. Every facility Exists for Constructing the two weirs and very little masonry will be required on the Channel that Connects them, the Cutting above alluded to being the only Expensive portion of this Section: Below the Rooshkoolia weir the levels are favourable until the Shargaddah ridge is reached near Soonamoo, Cutting through this ridge will Cost a large sum and Occupy much time and labour, as much rock will probably have to be removed, still the Cost need not be Extravagant if the work be done Systematically & Suitable and powerfull Machinery Employed; the blasting might perhaps be facilitated by the use of Dynamite, the stone blasted would Certainly be valuable, as building stone is seldom to be picked up in this District but has to be quarried: immediately below the Cutting the Shargaddah Nullah must be Crossed and a little further on the main stream of the Podahallow, this River is spanned near Sujelly by 9-30 feet Arches. the rest of the line on to Chetterpore is quite free from formidable obstacles, from the Mahammooz to where the Channel Crosses the Berhampore Road, the Channel bed might have a Continuous slope not Exceeding 6 inches per mile so as to be well adapted for Navigation; near the point where the road is Crossed, to drop the × ≟ 4 inches

Channel

Channel bed may be found advisable and then Continue it with a uniform slope on to Chetterpore where it would Command the low land to the South of Pauyam and might ~~terminate~~ terminate for the present.-

15. The drainages Crossing the line of Canal will be received into the Channel or passed under according to Circumstances, Streams irrigating Considerable areas of land would mostly be passed under Especially through the Zemindary Estates, as the most Economical arrangement and also to avoid water disputes, we should throughout the scheme interfere as little as possible with Existing irrigation - the Godahallow might be Crossed by a weir probably an Aqueduct with weir and Supply Channel above would be preferable, Constructed so as to prevent sand from entering the Channel the removal of which would be an endless Source of trouble and Expense.-

16. I should propose that the Canal should be from 5' to 6' deep and that it should be Entirely within soil where the Excavation is Easy - for the reasons usually assigned in favour of Such a mode of Construction; to avoid rock, however it would for portions of its length be taken partly or entirely within Embankments

Embankments.-

17. From returns received from the Collector it appears that belonging to the Government Talugs there are Commanded by the proposed Channel

17,369 Acres of irrigated land-

102,852 Acres Rain irrigated or dry

20,000 Acres Waste that Can be Cultivated

This is only a Rough Calculation and the Revenue Survey now in progress will probably shew a Considerable Excess over this Estimate. In addition to this Government land there are under the proposed Channel 142 Square Miles of Zemindary Estates, so that probably we might have to irrigate immediately about 200,000 Acres more or less thoroughly

1136
8
90880 ac.

18. I propose that the Canal joining the two Anicuts shall be Constructed to Carry 60,000 Cubic yards per hour and that the main Canal from the Rooshkoolia be of Capacity to Convey 120,000 Cyards per hour through the Shargaddah Cutting; this quantity to be gradually reduced after passing Dogoopoody as we approach the termination at Chetterpore. ×

800 cub ft / second

1600 – between this and [illegible] of about 120 f[illegible] [illegible]

19. To attempt to make an Estimate of the Cost of the project would be mere waste of time untill the general approval of Government has been accorded to the proposed works;

Nor

5 Nor has the proper moment arrived for determining the quantity of water that it is desirable to store upon each of the principal Rivers; there appears no reason to doubt but there would be an increase Revenue of 5 lacs per Annum from the South bank Channel alone, and the works might be Credited with 5 lacs on account of ½ the Cost of a Single Famine, also with at least ¼ a lac per annum on Account of increase Salt sales. The Reservoirs although quite a necessary adjunct to the scheme need not be taken into Account in the first Estimate the Cost of Construct=ing them would be amply repaid by the Revenue they would yield on the Second Crop, as in ordinary years they would be full in the begining of November; after a failure of the North East Monsoon this would not of Course be the Case as they would have been emptied in saving the first Crop.-

[Some infn about suitable sites for Reservoirs required —]

[But suppose both monsoons partially fail, as not [illegible] — Further [illegible] assurances to [illegible] irrigation]

20. Navigation Canals and other important works in the District should be pushed on with now as the irrigation works when once Commenced will require all the labour available (1) The Canal from the Chilka Lake to Ganjam though not perfected is Completed and Navigated, the Survey and Estimate for Continuing this Canal on to Gopaulpore are nearly ready (2) A still more important Canal would be one from

Ganjam

Ganjam to Aska where it would join the Main Irrigation Canal and finally terminate at Russelcondah, I would recommend that orders be issued for Surveys and Estimates for the first Section of this work Vizt. from Ganjam up to Sujelly - this Canal would pass through a highly Cultivated tract of Country at present quite impassable for Carts or even laden bullocks for more than Six = Months in the Year; and it would also be the = Means of draining a Considerable Area of Marsh land; from the imperfect returns before me I should Estimate that the traffic upon it would be about 40,000 tons Annually now Carried on roads @ 2as-6^p^, per ton per Mile - the Cost of Carriage by Canal would be 6 pice so that if another 6 pice were Charged as a toll the return on a length of 20 Miles would be 25,000 Rs per Annum Such cheap inland water Communication would give an impetus to the Salt trade and there would be a = Considerable saving in Cost of road Maintenance; taking advantage of Existing Channels, the Cost of Excavation would not Exceed one lac of rupees, the rise of 80 feet would be attained by 10 - 8' lift locks 60' x 10' Costing 80000 Rs total Cost of work Certainly

? the channels supplied by Sujelly anicut

not

Not more than 2 lacs

21. A Copy of this report will be forwarded to the Governor's Agent and Collector of Ganjam from whom I have received every Assistance applied for, and who will doubtless strenuously advocate the Execution of works Calculated to promote the prosperity of the District and to raise the depressed Condition of the people.-

Special Executive Engineer's Office Chetterpore 28th October 1868

J. Bickley Captain R.E. Executive Engineer on Special Duty Ganjam.-

Exd
Thurling
Est. Writer

From

The Executive Engineer
on Special duty
Paujain

To

The Supg. Engr. 1st D.

Dated
Despd } 28th October 1

Recd 4 - 11 - 68.

P.W. 4926/68.

Preliminary Report
upon proposed Irrigation
works in North Paujain

Forward to
Chief Engineer

Pros - 27th Jany 169 to 2498

No. 151
Submitted to the Ch. Engineer for Irrigt.
for perusal, to be originals returned.
a Sketch map, and Section, not yet received,
will be forwarded as soon as they come.

H. R... Capt. R.E.
Sup. E. 1st D.

Dated
4 Nov. 1868

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October 1865	"	"	.21	1.50	1.70	1.10	1.45	5.96	.851
November	.25	.33	.26	.20	.30	"	.20	1.54	.22
December	"	.02	"	"	"	"	"	.02	.002
	24.69	31.17	24.72	19.55	49.45	30.0	39.03	218.61	31.23
January 1866	.04	"	"	"	.01	.10	"	.15	.021
February	.70	.81	.32	"	2.66	2.50	.26	7.25	1.035
March	"	"	"	"	.56	.50	.18	1.24	.177
April	4.07	4.72	1.71	2.95	3.59	3.70	4.70	25.44	3.634
May	1.60	3.54	1.70	"	2.74	2.60	1.29	13.47	1.924
June	2.72	4.51	4.45	5.20	1.34	1.10	.83	20.15	2.878
July	3.89	4.62	3.14	8.0	12.88	12.50	5.70	50.73	7.247
August	11.08	14.47	15.34	16.0	21.97	21.70	12.47	113.03	16.147
September	9.69	11.35	5.95	9.60	9.19	9.10	9.28	64.16	9.165
October	6.08	10.93	12.14	8.30	7.73	8.60	8.94	62.72	8.96
November	.41	1.0	1.12	.90	1.81	1.0	"	6.24	.891
December	"	"	"	"	"	"	"	"	"
	40.28	55.95	45.87	50.95	64.48	63.40	43.65	364.58	52.082
January 1867	.20	.22	.47	.35	.36	.20	.54	2.34	.334
February	"	"	.45	"	1.12	"	"	1.57	.224
March	1.76	2.14	.33	1.20	3.73	3.50	3.09	15.75	2.25
April	1.28	2.55	1.35	4.60	2.95	3.30	2.42	18.45	2.635
May	1.10	1.84	1.39	1.60	4.20	4.10	.54	14.77	2.11
June	8.91	9.33	4.24	2.70	7.01	4.80	2.55	39.54	5.648
July	5.66	7.48	7.99	10.10	6.41	7.20	7.73	52.57	7.57
August	6.78	7.60	9.53	6.95	12.22	12.40	9.28	64.76	9.257
September	8.99	7.55	7.77	7.22	8.33	8.20	13.28	61.34	8.762
October	13.31	9.53	10.92	11.80	6.73	5.50	7.90	65.69	9.384
November	.71	4.37	3.30	7.10	.95	"	1.05	17.48	2.497
December	"	"	"	"	"	"	"	"	"
	48.70	52.61	47.74	53.62	54.61	49.20	48.38	354.26	50.608
January 1868	.03	.01	"	"	.33	.20	"	.57	.081
February	.90	.69	.85	"	1.24	1.20	.20	5.08	.725
March	.69	.32	"	"	.15	"	.82	1.98	.282
April	.64	1.17	.18	"	3.12	3.10	.46	8.67	1.238
May	1.12	1.95	1.36	4.27	5.61	5.60	2.70	22.61	3.23
June	7.45	7.42	9.62	9.40	11.83	13.0	14.44	73.16	10.457
July	2.82	4.44	4.36	5.30	13.54	11.60	5.44	47.50	6.785
August	9.15	7.13	6.56	6.95	6.25	4.20	5.86	45.60	6.514
September	6.37	9.60	4.36	7.70	4.27	4.10	8.67	45.07	6.438
October				1.80					1.800
	29.17	32.73	26.79	33.62	46.34	43.00	38.59	250.24	35.748

Special Executive Engineer's
Office Chetterpore
28th October 1868 } Esd
Dhurmsing
Est Writer

J. Bulkley Captain R.E.
Executive Engineer on Spl. Duty

Register shewing the Rain fall at the undermentioned Stations from 1863- upto 30th September 1868-

Months	Payaree	Chetterpore	Goomsoorcotta	Berhampore	Russelcondah	Russelcondah Mr Lewis	Aska	Total	Average	Remarks
1	2	3	4	5	6	7	8	9	10	11
January 1863	"	"	"	"	.01	"	"	.61	.001	
February	.44	"	.62	"	.01	"	.84	1.91	.318	
March	"	"	"	"	.25	"	.58	.83	.138	
April	.10	"	.06	"	2.08	2.10	1.20	5.54	.923	
May	1.71	1.70	.45	"	1.32	1.10	"	6.28	1.046	
June	11.34	7.42	8.76	"	12.54	12.0	10.27	62.33	10.388	
July	3.62	3.57	3.78	"	5.39	7.0	4.88	28.24	4.706	
August	5.29	5.16	7.10	"	12.53	13.30	7.46	50.84	8.473	
September	12.47.	18.20	12.43	"	10.82	9.20	6.12	69.24	11.540	
October	10.89	10.33	15.26	"	6.51	6.0	5.16	54.15	9.025	
November	1.28	1.41	1.06	"	.62	"	2.14	6.51	1.085	
December	"	"	"	"	"	"	"	"	"	
131	47.14	47.79	49.52	"	52.08	50.70	38.65	285.88	47.646	
January 1864	"	"	"	"	"	"	"	"	"	
February	.17	.68	1.71	"	2.96	"	.72	6.24	1.04	
March	.27	1.20	1.55	"	3.10	"	2.03	8.15	1.358	
April	.10	.24	"	"	1.57	"	1.21	3.12	.52	
May	.45	.57	.67	"	1.13	"	4.42	7.24	1.206	
June	4.74	5.42	4.20	"	3.50	3.50	2.45	23.81	3.968	Famine year.
July	7.91	7.66	5.58	"	9.31	8.70	5.20	44.36	7.393	
August	3.78	7.84	7.16	"	4.50	4.50	6.67	34.45	5.741	
September	9.38	4.19	7.40	"	4.47	4.70	7.03	37.17	6.195	
October	5.37	4.05	3.45	"	1.06	1.0	2.33	17.26	2.876	
November	.98	1.97	1.81	"	3.12	3.50	5.35	16.73	2.788	
December	"	1.13	.30	"	.11	"	1.25	2.79	.465	
	33.15	34.95	33.83	"	34.83	25.90	38.66	201.32	33.553	
January 1865	"	"	"	"	"	"	"	"	"	
February	1.70	2.71	4.70	"	2.22	"	"	11.33	1.618	
March	2.60	5.92	1.54	"	6.36	"	5.19	21.61	3.087	
April	2.05	"	.05	"	2.54	"	1.57	6.21	.887	
May	1.29	1.25	2.30	2.05	5.86	"	5.46	18.71	2.601	
June	3.50	4.75	2.83	2.0	7.05	7.50	5.42	33.05	4.721	Famine year.
July	3.83	4.17	2.36	3.0	8.51	7.80	7.39	37.0	5.285	
August	4.48	6.76	5.91	6.15	8.43	7.30	6.93	45.96	6.565	
September	4.99	5.26	4.62	4.65	6.48	6.30	5.42	37.72	5.388.	

Rent

P.W. 4926/68

Pres: 27" Jany/69 Lr Lr 498.

1/78/68

Superintending Engineer's Office
No. 150 1st Division Dowlaiseram
13
3rd November 1868

From

Captain J. G. Ryves. R.E.
Superintending Engineer
1st Division

To

Colonel J. C. Anderson R.E.
Chief Engineer
for Irrigation
Madras

Sir,

I have the honor to submit the report of results of survey operations for Irrigation projects called for in G. O. No. 1824 dated 10th June 1868 and in your No. 78 dated 17th instant.

Godavery - 2. With the exception of a survey and contour levels of the proposed site for a Reservoir to store the flood waters of the Yerrakalwa, our survey operations in the Godavery District have been confined to the Delta.

Ummmalomka tank Project - 3. For the Reservoir the work done was only some 15 square miles of survey and about 40 miles of contour levels. The latter appear to shew that a bund 7900 feet long

long at top; raised to 80 ft above the bed of the Yerrakalwa; would store 270 millions Cubic yards between the 30* and 60* ft levels.

* above bed of Yerrakalwa

4. In a bad season (say 15 inches of rain brought by the S. W. monsoon and half that quantity by the N. E. monsoon) a tank of the above dimensions established at that site, would supply about 465 millions cubic yards of water for irrigation⊗ while, if used, and paid for at the established rate, would give an income of 3½ lacs of Rupees per annum - and as the cost of the work would certainly not exceed 20 lacs this project would probably be remunerative.

⊗ i.e. after the proper deductions for evap.ⁿ - quantity taken by existing tanks &c. —

5. Besides its value as a source of supply for irrigation this Reservoir would be of great service in reducing the volume of the Yerrakalwa Floods which have to be passed on across the Delta between embankments.

6. The operations in the Delta de-serve no special notice, except that they have proved that the Civil Engineering College cannot turn out Efficient Surveyors

Delta project.

and

and levellers for the Public Works Department.

7. About 380 miles of correct levels were, after much trouble and delay and at very heavy expense, obtained.

8. These levels of course have not brought to light any new information they were necessary only for the prepara-tion of the drawings and Estimates of the project for the completion of the Delta works.

Vizagapatam

9. In Vizagapatam there were no Survey and levelling operations in connection with new irrigation project.

Ganjam

10. In Ganjam Captain Beckley has since May last been engaged in see-king for sites for Reservoirs &c in a thorough examination of the whole of the Valley of the Rooshkolia below the Ghauts with a view to the preparation of a complete scheme for ensuring a certain supply of water for extending irrigation in that District. I have not yet received the report called for from that Officer in accordance with your Memo No. 78. But I will not further delay the submission of this report.

The

The Gangain report shall be transmitted im-
:mediately it is received and in the meanwhile
a general preliminary report just re-
:ceived from Captain Beckley will be
forwarded in a day or two, which will
exhibit the general scope and principal
results of the investigation made by that
Officer.

I have &c. &c

[illegible] Captn R.E.
Superintending Engineer N. Divn

No 147

Print

From
The Supg Engineer
N. Divn
To The Chief Engineer
for Irrigation
Dated 3rd November 68
No 10

No 150

Reports the results
of survey of Irrigation
for Irrigation projects
called for in G. O.
No 1826 of 30 June
1868 and in No 7807
17 October 1868 -

[illegible]

Reg: 27 - Aug 14 L 1429

Special Executive Engineer's Office
No. 114.
Camp Aska - 8th November
1868.

From
Captain T. Beckley R.E.
Executive Engineer on Spl.
Duty Ganjam -

To
Captain J. G. Rynes R.E.
Superintending Engineer
1st Division

Sir,

I have the honor to submit the following Report of work done in Connection with investigation Irrigation projects in the Ganjam District. I may however remark that a Report and plan shewing work done has already been submitted.

1. The object in view is to irrigate a Considerable portion of the valley of the Rooshkoolia by means of River Channels supplied in part with water Stored in Reservoirs - No sites for Reservoirs have been definitely fixed upon but many miles of Country have been inspected. -

2. 159 Miles have been levelled, Surveyed and plotted, the levels have been checked and found Correct. - Sections of the Mahanuddy

and Rooshkoolia have been taken at sites of proposed weirs, also at Aska above and below junction – Observations have been and are being taken to determine Rainfall and daily discharges of Rooshkoolia and Mahanuddy at Aska –

3. The results have been set forth in a previous report so far as present investigation admits of my forming an opinion as to the works that would prove most beneficial to the Country. –

I have the honor to be
Sir
Your Most obd Servant

J. Bukley Captain R.E.
Executive Engineer on
Spl. Duty Ganjam

15

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No. 159.

Forwarded to the Chief Engineer for Irrign. with reference to his memo. No. 78 and in continuation of letter No. 150. dated 3rd Novr./68. from this office.

H. R. [signature] Capt. R.E.
Supt. Engr. 1st Dn.

12. Nov. 68

From
The Executive Engineer
on Special Duty
Ganjam

To
The Supdg. Engineer 1st Dn.

Dated
Despd. } 8th November 1868.

Re.

Submits reports upon the works done in Connection with the Investigation of Irrigation Projects in the Ganjam District

of 14th

P.W. 4926 / 68.

Pro. 27th Jany 69 No. 498

141 3 50 34

Memorandum of the probable cost of the Hindoopoor Project

Annicut ———— Rs	40,000
Head Sluice ————	4000
5 Wasteweirs ————	5000
20 Drainage inlets ————	2000
2 Tank supply sluices ————	500
2 Tank sluices ————	500
Improving Suddapully Tank ———	5000
——— Streekuntapoorum do	6000
Raising Poolcoonta Tank ———	3000
1 Bridge ————	2000
1 Aqueduct ————	500
11 Miles of channel 33 x 5 feet @ 8 c. p.	44352
Sundry Stone revetment ———	2000
Tamping at rear of do ———	300
	115,152
Other charges ———	11515
Total Rupees	126,667

Assuming the cost at 1,50,000 & the increase revenue at 9,800 Rs. the return would be 6½ per cent. deducting 2 per cent for repairs there would be a gain of 4½ per cent.

(Initialed) A. S. Mc.

Memorandum of Revenue of Tanks to be benefited by the Hindoopoor Project taken from the Tahsildar's Statement dated 16th July 1868

Tanks		Highest Revenue	Average Revenue	Difference	Minimum Revenue
		Rs			
Hoolecoonta ———		994	757	237	618
Cuggul ———		1535	1131	404	557
Kirkerra ———		1956	1360	596	988
Buswanpelly ———		1043	799	244	764
Streekuntapoor ———		1176	944	232	735
Hindoopoor	Soogoor ———	4600	3870	730	2824
	Soudapa ———	1237	964	273	455

Tanks		Highest Revenue	Average Revenue	Difference	Minimum Revenue
Catuoor	Catuoor	4879	2414	1965	749
	Malapoorum	2355	1809	546	1222
	Saraucota	2135	1542	593	835
	Petacoor	2690	2024	660	1070
Petacoor	Buchgaupully	4512	2456	2056	1171
	Sudlapully	319	260	59	196

8595

New land 300 acres @ 4 — 1200

9795 = 8 percent or better on proposed expenditure

Bellary
27th November 1858

(Signed) J. Gray Dy Asstt Comy
Asstt Engineer

(True Copy)

A. W. Abbott Major R.E.
Supg Engineer 3d Dn

P.W. 4926/68

Pros-27" Jany 1869 No 2498

Memorandum of the probable cost of the Hindospoor Project.

1168

Statement shewing the ayacut and cultivation of Fusly 1277 under the Hosahully (hamlet of Canekal in Raidroog) tank and the land that could be brought under cultivation by the proposed improvement to the said tank.

147

Ayacut-wet: Circar Acres	Ayacut-wet: Circar Assessment	Ayacut-wet: Swamy Acres	Ayacut-wet: Swamy Assessment	Name of the village	Circar dry: Cultivation Acres	Circar dry: Cultivation Assessment	Circar dry: Ayacut Bunjer Acres	Circar dry: Unassessed waste Acres	Total acres	Amount Rupees of wet rate at 8 Rupees an acre be charged on Column 10	Deduct the assessment on dry cultivation. Vide column 7	Amount of the realizable increment	Swamy dry: Acres	Swamy dry: Amount of water rate if charged at 8 Rupees an acre	Total: Acres of columns 10 & 14	Total: Assessment of columns 13 and 15	Remarks
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
401	1286	11	27	Kanékal	1003	290	5594	..	6597	52776	290	52486	1237	9896	7834	62382	Ryots are not willing to pay assessment at Rs. 8 per acre for the land that could be cultivated by improving the tank, but they have executed an agreement to pay Rs. 4 for a single crop per acre.
				Yerragoonta	20	5	80	..	100	800	5	795	253	2024	353	2819	
				Vapparallu	.	.	145	.	145	1160	.	1160	-	.	145	1160	
					1023	295	5819	.	6842	54736	295	54441	1490	11920	8332	66361	

33180½ At 4 Rs. an acre 1st Crop assessment
16590¼ Taarjasty on 2nd Crop assessment
49770¾ Total

Bellary Collector's Office
Durgee 30th November 1868

(Signed) H. Sullivan
Collector

(True Copy)

A. S. M[illegible] Major R.E.
Supg. Engineer 3rd Dn.

The cost of this project I calculate will be about 7 Lacs - The Collector has only entered increased Revenue under Hosahully Tank but there will be also increase under the Yapazaut Tank - Taking 50,000 as the increase and omitting Taarjasti altogether shews a return of 7 per cent or 5 percent after deducting for repairs.

(Initialed). A. S. M

8

Pen^d

P.B. 4926/68

Pros: 27th Jany 1[?]9 L^r N° 498.

Statement shewing the
ayacut and cultivation of
Fusly 1277 under the Hosahully
hamlet of Cauhal in
Paedrooy tank and the
land that could be brought
under cultivation by the
proposed improvement to the
said tank -

Statement showing the increase of Revenue to be derived by construction of the Proposed Canal to the Poremamilla Tank—

Name of village	Name of work	Number of acres that will be brought into cultivation	Tirvayjeity at Rs 5 per acre as per Gazette order	Tadeljeity		Total increase	Remarks
				Acres	Assessment		
		a — c	R — A — P	a — c	R — A — P	R — A — P	
Poremamilla	1 Big tank	1000 — 35	5004 — 8 — 0	1192 — 4	3401 — 0 — 0	8405 — 8 — 0	
	2 Rayasamudrum tank	19 — 15	96 — 14 — 0	122 — 34	437 — 2 — 6	534 — 0 — 6	
Sunkaravaram	1 Akisiddoopully tank	241 — 9	1205 — 0 — 0	0 — 0	0 — 0 — 0	1205 — 0 — 0	
	2 Nallagondapully tank	10 — 29	53 — 12 — 0	0 — 0	0 — 0 — 0	53 — 12 — 0	
	3 Peddoogoopully do	~~493~~ 50 — 0	250 — 0 — 0	0 — 0	0 — 0 — 0	250 — 0 — 0	
	4 Chintlapully do	493 — 30	2468 — 12 — 0	0 — 0	0 — 0 — 0	2468 — 12 — 0	
	5 Kalluthundpully Sluice	635 — 33	3179 — 0 — 0	102 — 20	302 — 0 — 0	3481 — 0 — 0	
Pendlimurry	1 Pendlimurry tank	11 — 1	55 — 10 — 0	36 — 0	150 — 0 — 0	205 — 10 — 0	
	2 Alapoorum do	43 — 8	216 — 0 — 0	32 — 0	100 — 0 — 0	316 — 0 — 0	
		2506 — 5	12,529 — 8 — 0	1485 — 18	4390 — 2 — 6	16,919 — 10 — 6	
	By Sluice in the Channel itself.						
Sunkaravaram	1 Sunkaravarampully	95 — 35	479 — 7 — 0	0 — 0	0 — 0 — 0	479 — 7 — 0	
	2 Ramapoorum	146 — 36	734 — 10 — 0	0 — 0	0 — 0 — 0	734 — 10 — 0	
	3 Nallagondapully	156 — 14	781 — 14 — 0	0 — 0	0 — 0 — 0	781 — 14 — 0	
Mamillapully	1 Mamillapully	41 — 31	208 — 14 — 0	0 — 0	0 — 0 — 0	208 — 14 — 0	
Kalsapaud	1 Kalsapaud	0 — 0	0 — 0 — 0	62 — 0	615 — 0 — 6	615 — 0 — 6	
		440 — 38	2204 — 13 — 0	62 — 0	615 — 0 — 6	2819 — 13 — 6	
		2947 — 3	14,734 — 5 — 0	1547 — 18	5085 — 3 — 0	19,739 — 8 — 0	Total increase

Poddatoor Range Office
Camp Nunnyalunpetta
4th December 1858

(True Copy)
A. S. Ulbary Major
Supt. Engineer 3rd Divn.

(Sd) G. W. Lewis
Supervisor
P. Range

From

The Sub-Engineer
Sathuli Range

To

The Supy Engineer
3rd Division

P.W. 4926/68

Dated 4th } December/68
Recd 7th }

Statement shewing the increase of Revenue to be derived by construction of the Proposed Canal to the Poremamilla tank

Pros-27th Jany/69 D. No. 498

Memo of Enclosures to Letter

No. 122 dated 11th December/68.

R.Wt.	177 - 11	Supg. Engr. 9th Div.	No. 150	d/- 3rd Nov. /68.		
"	186 - 2.	— Do. —	No. 159	" 12th — do — /68.		with plan
"	178 - 2	— Do. —	No. 151.	" 4th — do —	"	with Register
"	149 — 1	— Do. 6th Dn.	No. 336	" 1st July	"	
Secy	— 2 —	Do. 2nd Dn.	No. 44	" 1st — do —	"	with plan
— " —	2	— Do. 8th Dn.	No. 884	" 3rd — do —	"	with copy of the survey operations map of
— " —	1	— Do. 5th Dn.	No. 71	" 18 — do —	"	
— " —	8	— Do. 4th Dn.	No. 2432	" 20th Sept.	"	with 7 Reports
— " —	1	— Do. 7th Dn.	No. 102	" 18th — do —	"	
— " —	1	Spl. Ex. Engr. —	No. 666	" 19th — do —	"	
— " —	2	Supg. Engr. (?) 3rd Dn.	No. 1925	" 28th — do —	"	with 1 statement

one (1) letter from the Supt. in charge Paddatur Range (3. Dn.) to the Supg. Engr. 3rd Dn. No. 465 - d/. 4th Dec. 68 with 5 enclosures (statements)

1. Plan

1 — do — (Section of the bed of the Chinna Sevollyaur)

PN: 4926/6

155 58 130

Poddatoor Range Office
Camp Neindy Nemplett
4th December 1868

No. 1,63 of 1868/69

From

The Supervisor in Ch. of
Poddatoor Range

To

The Superintending Engineer
3rd Division

Sir

With reference to your Docket No. 3116 of the 23rd Ultimo, I beg to enclose a Statement shewing the expected Revenue under the several Irrigation works that will be benefitted by the proposed Canal. I am unable to supply the information in a Complete form as required, but I have applied to the Tehsildar for the same and will submit it on immediate receipt. The total increase you will perceive will be about Rs 19,700 or about 13 per cent of the estimated amount.

The Canal will be 10 miles and 1 furlong in length, but as the line passes through the Chintallapally Tank &c for 1 mile, the total length of Excavations will be 9 miles. The width of the Canal throughout to be 15 ft, with slopes of 1½ to 1, and to allow of a head of 6 ft of water. The grade from the 1st to the 4th Mile will be 1½ ft per mile, and for the remaining distance 2½ ft per mile. The average discharge is 520 ft per second and as the capacity of the Poramamilla and Chintallapally Tanks amounts to 32,019,662 Cubic yards these reservoirs will be filled in about 20 days of monsoons, the remaining days being made available for the other Tanks benefitted viz. the Kalasapaud Small, Pendlimarry, Peddagoorpally

$\frac{32,019,662}{8000} = 4000$

Akorahettepally and Rangasamudram Tanks -

The length of the anicut will be 250 ft, and to be 6 ft above the deepest part of the river bed - The crest of the dam will be on a level with a dewing flood line - The afflux caused by the erection of the dam will raise the highest flood line by 2 ft; but as the banks are high, no other works will be required to protect the fields from inundation -

I annex a Memo shewing the details &c of the probable Estimate for the entire Project

I beg to remain
Sir
Your most Obedient Servant
(Sd) G. W. Lewis
Supervisor D.P.W.
Paddatur Range

(True Copy)
A. T. Albert Major
Supt. Engineer 5th D.

From
The Supervisor D.P.W.
Paddatur Range

To
The Supdg Engineer
5th Division.

Dated 4th } December 1850 -
Recd 7th }

P.W. 4926/68.

Reports with reference to Distt. No. 3116 of 23rd Ultimo regarding the Poreamulla Tank project ...

Statement referred to in letter No. 1925. of 28th Augst 1858.

Bookachenta Project 15

This project comprises the construction of an Anicut across the Pennair River near Nagutmuddika in about Latitude 14° 10', for taking a Channel running Northward round the Pairoor Doobrampally Tank and then through the ridge into the drainage falling into the Hudrapoor Tank - for putting an Anicut across the surplus Channel of this Tank near Gaundapurty and turning the water into the Bookachenta Tank which it is proposed to raise and improve. Survey and levels completed. Estimates under Examination.

Roddum Project

This project comprises an Anicut across the Pennair River below Ootacoor in Latitude 13° 55' to supply the Cullapee and other Tanks as far as E. Codyhully or Roddum large Tank. The survey and levels only lately commenced, but should be completed by end of August.

Nindoo Koor Project

This project comprises an Anicut across the Pennair River about a mile above Keer Kerra in Latitude 13° 45' with Channel for supplying the Hudoopoor, Auggall, Colanoor and other Tanks down as far as Ootacoor. Survey and levels nearly completed but further information called for.

These 3 projects are being investigated by Ensign and Assistant Engineer J. Gray.

Huggry or Hoshully Project

It is proposed to construct an anicut across the Huggry River near Joonjaramanhully in Latitude 14° 38' Longitude 77° 3' E. and to take a Channel to supply the Yaparaul Tank, Hoshully Tank, which is to be raised and improved, and the Cunnakul Tank.

The survey &c. of this Project was commenced in July 1857 by Serjeant Power of the Sappers and Miners who however was obliged to resign in October 1857 in consequence of ill health. It was again taken up in January by a Mr. Ross, a young surveyor, who however was obliged to resign after a short time from ill health: it is now, (since middle May last) being surveyed by a

Mr. Wylie. Up to end of June the work done only Comprised Hoskully and Cannacul Tanks with all the proposed improvements.

This is for Constructing a Tank in about Lat. 14°-10'. Long. 77°-46' above the Village of Potal-Coonta and across the drainage from the direction of Penudemdah.

The Survey and Levels are completed. Estimate under preparation. This work was surveyed and levelled by Mr. Surveyor Dady.

This Project which is in the Budwail Talook, Cuddapah District is for an Anicut in Lat. 15°-9' and Long. 78°-59' E, across the Sugglyair to take the water by an old Channel to the Poremamla and Budwail Tanks. It is being surveyed and levelled by Mr. Surveyor Dady under the orders of Mr. Supervisor Lewis. The Channel has been surveyed &c as well as the Poremamla Tank and work is now being closed.

A. Allsbey Major R.E.
Supdg. Engineer
3rd Dn.

Bellary
29th August
1868.

1868-69

From
The Supdg. Engr.
3rd Dn.
To
The Secy. to Govt.
P. W. D.
Dated 29th Augt. /68.
Recd. P.W. 3342/68
Encls. to No. 1925.
P.W. 4926/68.
Statement shewing the Progress made on Certain new Irrigation Projects in the Division

32

Probable Estimate for proposed Canal into the Poremamilla Tank – 157

Items	Amount
Earthwork excavating Canal into tank &c ~~Raising~~	75,000
Raising Chintalapally Tank 6 ft constructing new Escape and Sluices	7000
Anicut	20,000
Head Sluice	5000
Aqueduct over Polee Vagoo	7,000
Do — 4 more water courses	10,000
2 Road Bridges	4000
5 Sluices	1500
12 under drains &c to pass Irrigation channels &c	3,000
Compensation for lands & Sundries including Superintendence & Stone Sheds	17,500
Total Estimate Rs	1,50,000

Camp Nandyalumpetta
1st December 1864

(Sd) G. W. Lewis
Supervisor
P. Range —

(True Copy)

A. S. [illegible] Major
Supdg. Engineer 3rd Divn.

Assume 2 Lacs as the cost and the increased Revenue at 20,000 Rs shews a return of 10 per cent or 8 per cent after deducting for repairs

(Initialed) A. S. [illegible]

PM. 4926/68.

No. 884 Superintg. Engineer's Office 8th Dn.
Madura 3d. July 1868.

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From

Lieutenant Colonel C. V. Wilkieson R.E.,
Superintending Engineer
8th Division

To

Colonel C. A. Orr R.E.
Secretary to Government P.W.
Madras

Sir,

Enclosure 1.

With reference to G.O. No. 1824, dated 10th June 1868, I have the honor to forward Copy of a Statement of Survey Operations carried on in connection with the Streeviguntum Annicut project. —

I have &c.

C. V. Wilkieson Lieut. Col. R.E.
Superintending Engineer 8th Dn.

PW ~~No 884~~, 1868 Dept

From No. 2549

The Supg Engr
8th Divn

To

The Secy to Govt
P. W. D

Dated 3d } July 1868
Recd 6 }

Enclo. 1

P.W. 4926/68

Forwards copy of a statement of Survey operations carried on in connection with the Streeng-[illegible] quntum Aricu[illegible] Project.

Pro. 27th Jany/69 Lr. No. 498.

No. 122.

To

THE SECRETARY TO GOVERNMENT,

PUBLIC WORKS DEPARTMENT.

SIR,

1. I have the honor to forward reports from the Superintending Engineers of Divisions on the results of surveys and investigations lately carried out in connection with Irrigation Projects in this Presidency, as called for by the Government in G. O., No. 1,824, dated 10th June 1868, and by the Government of India. Besides summarising these reports, I propose to furnish the Government with an account of the bearings of the projects which have been under inquiry, in connection with the present condition, and the extension of irrigation in this Presidency.

2. To commence at the Northern boundary:—In Ganjam, Captain Beckley, Royal Engineers, has recently been employed in examining the capabilities of the district for extended irrigation, and has had his attention engaged in devising means for utilising the supply of the principal river in the district, the Rooshkolia (drainage area 2,400 square miles); and a preliminary report has been submitted. The present condition of the irrigation in Ganjam is described as extremely defective. There are a great number of tanks, but, with two exceptions, they are of insignificant size, and though the rain-fall even in the worst years is believed to be sufficient for the wants of the district, if reservoirs were available to store even one month's supply, the loss of a portion of the crops is a common occurrence even in average years, and in bad years the whole crop is lost, and a famine is the result. While the smaller tanks are powerless to save the cultivation under them, the large tanks are perfectly efficient. Of the two specified by Captain Beckley, one yields a revenue of 15,000 Rupees, and no remissions have ever been made, and the other, which yields upwards of 10,000 Rupees, furnished a plentiful supply of water to the lands under it when the failure of crops elsewhere was so complete as to occasion a famine. "The general condition of the district must, I think, be pronounced unhappy, and such as to demand amelioration. The prevailing custom, of growing rice upon lands depending solely on the rains for irrigation, must always be a source of anxiety to the people and to Government, and must produce famines periodically, perhaps the oftener now, that high prices and other causes have given great impetus to the export grain trade; the soil is rich and fertile: there is little barren or stony land—the hills rising abruptly from the plains: the rain-fall is very large, though not excessive, and though variable, never appears to fail: all parts have short easy access to the sea; but, notwithstanding all these advantages, Kurnool and much of the Bellary District evince signs of far greater prosperity than Ganjam. Doubtless much of the squalor and wretchedness observable around is due to the apathetic character of the Ooriahs, and one great argument in favor of large Public Works is that through them the people would be trained to labor, and their indolence gradually overcome."

3. Captain Beckley suggests the construction of a series of large reservoirs, but in preference to dealing with them singly, he proposes to form them in con-

nection with channels from the principal streams in the district. He proposes to construct a dam across the Rooshkolia to the west of Aska, and above the junction of its principal tributary, the Mahanuddy; to lead the supply of the latter by a cross cut from a point above, the configuration of the country preventing his fixing his head works below the junction; and then to carry the combined supply from the two rivers by a cutting to the southward, between two ranges of hills, into the valley of the Shargaddah and Godahallow, (two other feeders of the Rooshkolia.) The plain country is then reached, and no obstacle would be experienced in carrying the channel onwards to the coast at Chetterpoor near Ganjam. It is further proposed to make the channel navigable, and to open out the section from Injelly to Ganjam, in the first instance. Captain Beckley appears to have formed a favorable opinion of the scheme, as regards its remunerative results, and its effect in improving the condition of the country, but the investigation cannot as yet be considered to have advanced to such a stage as will allow of Government forming any conclusions regarding it, especially as no definite information has been furnished concerning the water-supply of the Rooshkolia; but it may be surmised that the works projected will be of an exceptionally expensive character, partly in consequence of storage for water having to be provided in addition to an entirely new system of channels, and partly from the necessity of carrying the main channel through a heavy cutting in rock. I think it very desirable that the investigation should be continued, and that Captain Beckley should be furnished with such special establishment of Surveyors as he may require to work out the project thoroughly. Up to the date of Captain Beckley's last report, 160 miles of ground had been surveyed and levelled, and observations were being made of the rain-fall, and the daily discharge of the Rooshkolia and Mahanuddy rivers.

4. In Vizagapatam there are no important irrigation works, nor are any in contemplation. Both in this district and in Ganjam there are extensive Zemindary estates, and the management of the irrigation works is in the hands of the proprietors. On this account the field for improvement is of a limited character, especially in Vizagapatam, where the area of land under cultivation by the Government Ryots is only between 60,000 and 70,000 acres.

5. Godavery Delta.—The channels in this Delta, which were commenced in 1847, combine navigation with irrigation, and have been in operation for a number of years. The alignment may be considered tolerably complete, as it already embraces nearly the whole area of the Delta. The improvements that are required are mainly the simple enlargement of various channels, to admit of their carrying a further supply of water, and of bringing fresh land under irrigation; but various other works of a miscellaneous kind are also necessary, especially as regards provision of outlets for the discharge of the cross drainage of the country which the channels intercept, and of the surplus water from the irrigated lands and from the channels themselves. Various locks on the larger channels, which were originally constructed on the most rigidly economical principles, and in not a very substantial manner, and which are now in bad order, will have to be replaced by larger, more commodious, and more efficient works. The fall of the bed on some of the channels, especially along such portions where the current is inconveniently high for navigation, has also to be rectified; and the subsidiary channels have to be extended and improved. Up to the end of 1866-67, the expenditure on the Godavery Delta works, exclusive of the charges for general establishment, has

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amounted to the following sum:—

	RS.
New Works	42,45,648
Repairs	34,17,029
Machinery	4,16,116
	80,78,793

6. A project for the formation of a considerable reservoir beyond the Delta limits has recently engaged the attention of the Superintending Engineer, Captain Ryves. The site is at the village of Unnoomoolunka. Fifteen square miles of country have been surveyed, and forty miles of contour levels carried out, from which it would appear that about 465 million cubic yards of water would be obtained on the supposition that the fall of rain is only 22½ inches. The bund would be eighty feet high, and one and a half miles long, and the cost would be about twenty lacs. This project has not been worked out in detail, and it would be premature to express an opinion upon it; but it is desirable that the investigation should be continued, since as Captain Ryves remarks, besides its value as a source of supply for irrigation, the reservoir would be of great service in reducing the volume of the Yerrakalva floods, which have now to be passed across the Delta, between embankments, and which in seasons of excessive rain-fall, *may* be productive of very serious injury to extensive tracts of irrigated lands.

Latitude 17° 2'
Longitude 81° 27'

7. The construction of an anicut across the Godavery at Polaveram, about twenty miles above Rajahmundry, was advocated many years ago by Sir A. Cotton, (I write from memory, and may be mistaken, as I have been unable to trace a reference to this project in any of Sir. A. Cotton's reports in my possession,) but the subsidiary channels would necessarily be of a more expensive character than those in the Delta, and although the project is likely at some future period to merit attention, it cannot be seriously thought of until the Delta system is fully completed.

8. KISTNA DELTA.—The works are similar in character to those in the Godavery, but having been commenced five years later, they are not so far advanced. The general scheme for completing the whole of the works has already been submitted to Government, and sanction has been accorded to various projects, forming portions of the whole, which will occupy the establishment for a considerable period. The detailed plans and estimates for the remainder of the works are in a backward state, and at this moment are in abeyance, in consequence of the Superintending Engineer having expressed his inability to form a reliable estimate of the whole area of land which is likely to be brought within the influence of the channels eventually.

9. The expenditure on the Kistna Delta works up to end of 1866-67 has been as follows, charges for general establishments not being included:—

	RS.
New Works	27,35,196
Repairs	11,05,832
Machinery	1,47,489
	39,88,517

10. In the Kistna District, but beyond the Delta limits, a project has been under investigation for utilising the flood-water of the Moonyair, a considerable

river (drainage area 3,050 square miles), which passes through the Nizam's territories to within thirty miles of its junction with the Kistna. The project will have to comprise the formation of tanks for the storage of flood-water, and in that respect it will be more expensive than the majority of irrigation works which have been carried out by our Government.

11. A project for the restoration of an old native tank at Dondapad, in the south-west corner of the district, has also been partially investigated, and Government allotted funds in 1867 for the prosecution of this work and of another of a similar kind, but the preparation of the plans and estimates was not sufficiently advanced to warrant the Superintending Engineer commencing the work during that year, and since then the Officer who was employed on the investigation, (Captain C. J. Smith, Royal Engineers,) has been obliged to go Home on medical certificate. The drainage area is of limited extent, thirty square miles, and no very important results are to be anticipated from the work.

12. Both in the Godavery and Kistna Districts, the irrigation works out of the Delta limits, though numerous, are individually unimportant. The country is undulating, and in some places hilly, and the works cannot be embraced under one or even under many separate systems : they must be treated in a great measure singly. A great deal of cotton is grown in the south-west portion of the Kistna ; the soil is also well adapted for dry cereal crops, especially for cholum or jowar. The tanks besides enabling the cultivators to raise a small quantity of rice, are also very valuable as reservoirs of drinking water for the people and their cattle. The Kistna itself has no influence beyond the Delta, as the country rises rapidly away from it. It carries an enormous body of water to the sea even in the worst years, and it would be quite possible, if an anicut were constructed about thirty miles above Bezwada, to lead the water to a much higher level than can be commanded by the existing channels. But such a project would be greatly more expensive than the Delta works, owing to the undulating and rocky character of the country, and it would be quite premature to take it up seriously, while the irrigation in the Delta is only half developed. This project was recently recommended for investigation by the Acting Collector of the Kistna District, Mr. Wilson, who is under the impression that the site he selected at Chintapully had not attracted the attention of the Engineers in the district; but it will be seen on reference to the original report* on the Kistna anicut, that the river was fully explored, and that the site in question was rejected on account of the difficulty of dealing with the floods, which there attain a height of fifty or sixty feet above summer level.

G. O., No. 3,316, dated 20th October 1868.

* Professional papers, Madras Engineers, Vol. IV. p 8,9.

13. The Nellore District is traversed by one large river, the Pennair ; drainage basin 20,000 square miles. As far as Sungum, on the north bank, and to near Nellore on the south, the country falls towards the river, but from these points towards the sea a considerable alluvial tract extends, from the north and south banks of the river respectively. From Nellore, on the south bank, the Pennair water has been distributed by means of an anicut, and a complete system of channels to the whole of the land which can be commanded in that direction, which may be considered as a parallelogram twenty miles long and twelve wide.

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14. On the north bank the tract within the command of the river is already very richly provided with tanks, to some of which flood water has hitherto been led by means of imperfect channels of native execution. It is now proposed to form head works at Sungum, thirty miles from the sea, to lead all the ordinary flood water available in the Pennair, after the lower Delta works are provided for, by a capacious channel, into the Kanigeri tank, already one of the largest in the country: to enlarge its capacity, and that of another tank adjacent to it, so as to allow of their holding together about 340 millions of cubic yards; and to distribute the water from them not only to all the purely deltaic lands which are under command of them, but to a tract of country beyond. The area to be irrigated is computed at 80,000 acres. This project, which is estimated to cost between twenty and thirty lacs of Rupees, is now matured, and the preparation of the plans and estimates far advanced. I have every reason to believe that the project, which has been drawn up by Mr. R. Smith, Executive Engineer, will commend itself to the favorable consideration of both the Local Government and the Government of India.

15. The other rivers in Nellore, with the exception of the Soornamookhy, near the southern limit of the district, and the Gundulcumma, on the north, all rise in the Eastern Ghauts, which run nearly parallel to the sea, and at the distance from it of fifty or sixty miles. The floods brought down by them are of a spasmodic character; and as their supply is derived almost entirely from the north-east monsoon, which is not only of short duration, but of very uncertain character, there is no field for any extensive irrigation systems, besides those above noted, in this district; though doubtless a good deal may be done towards improving the flood channels leading to tanks, and the tanks themselves, some of which are already very fine works. The examination of the Soornamookhy (drainage area 1,174 square miles) will shortly be taken in hand. Improvements to the supply of various tanks under it have been contemplated for several years past, but in consequence of the greater part of the land along the south bank being Zemindary, and of the Zemindar claiming certain rights with regard to the water-supply of the river, the local Officers have been deterred from taking up the subject, being hopeless either of coming to an amicable arrangement with the Zemindar, or of being able to establish a right to any specific proportion of the water in favor of the Government ryots. The longer any matter of this kind is left unsettled, the more difficult it is to arrive at any result, and I would, therefore, propose to have the river examined as soon as a Surveyor can be set free from the Sungum project. The Gundulcumma (drainage area 3,100 square miles) is a considerable river, but the supply from the most important part of its basin is already absorbed by the great Cummum tank, and from thence onwards to the sea the channel is an unfavorable subject for artificial appliances, on account of its very considerable depth and the heavy expense which would in consequence have to be incurred to lead the water in low freshes to the surface of the ground.

16. The Kundalairoo, which passes close to Gudur, twenty miles south of Nellore, has a drainage basin of 1,240 square miles. There is already a well built native anicut across it, and a channel feeding Gudur tank. Another channel from a branch of the same river to the Chennur tank is in progress, but the resources of the river cannot yet be said to be fully utilised, and it is desirable that they should form the subject of further investigation.

17. Turning to Bellary, Cuddapah, and Kurnool, it will be seen, on reference to the Map, that the Toongabudra runs along the northern boundary of Bellary, and

that, at a short distance below Kurnool, it is joined by the Kistna; also that all the other rivers in these districts derive their supply from what may be termed local drainage. The Huggry, a branch of the Toongabudra, is an exception, but though it comes from a distant part of the Mysore country, partially within the influence of the south-west monsoon, its supply, owing to local circumstances, is scanty and uncertain, and it is consequently a very poor river as regards its power of irrigation. On the Toongabudra there are several anicuts and channels, and as that river derives its unfailing supply from the Western Ghauts, in which there is an abundant fall of rain, the cultivation under them is secure, and of course very valuable to the small section of the district to which their influence extends, when other sources of supply fail. But they are small works, and do not offer any great field for improvement, to say nothing of the claim which the Madras Irrigation and Canal Company have on any of the Toongabudra water which is not yet utilised. It is on the Huggry that the Mauri-Convai works are contemplated by the Mysore Government, and if they are carried out, of course even less water than before will reach the Bellary District. But it is hoped that with the aid of various branches, which will be unaffected by this scheme, there will be enough water left to supplement the supply of several considerable tanks. A project with that end in view has been under investigation, and may shortly be expected. The other rivers in the three districts above named are nearly all in the Pennair basin. It will be observed that the Chittravutty, the largest of its branches, and also most of the smaller branches, have been dammed across to form tanks, and some of these works are not only extensive, but exhibit a boldness of design which is worthy of high admiration. With extraordinary natural disadvantages to contend against, the old native rulers have indeed done so much that the difficulty now is not, from a number of promising projects, to select the best, but to find any projects which are worthy of consideration at all. The Irrigation Company have already secured a right to the Toongabudra, but were it otherwise, the feasibility in an economical point of view of further utilising its water for irrigation from any point higher up than Kumply is made more than doubtful by the extremely uneven and rocky character of the country skirting its course. The other rivers have an uncertain supply, and though they are no doubt useful, in ordinary seasons, for the better supply of the tanks connected with them, it would be puerile to look to them as a safeguard against famines, for if the local rains fail, they fail also. The only projects which have yet come forward, and which are likely to turn out well, are two anicuts and sets of channels on the Pennair, at the distances of from thirty to fifty miles from its source. In the locality in question, there are already a series of tanks, some of which derive a partial supply from the Pennair, by means of temporary dams across it, and small channels from it. The proposed works will, no doubt, place the supply on a better footing; and though it may be difficult to prove that they will secure a return exceeding five per cent. on the outlay, it is possible that that standard may be reached. Another project on a larger scale, and which is nearly matured, has been designed with a view to supplementing the supply of the Anantapoor and Bookacherla tanks by means of a channel from the Pennair, which would be led off shortly below the terminus of the other new channels above described, but these tanks are not in the valley of the Pennair, and the cutting through the water-shed would be of a very expensive character. This might not be an insuperable objection if an abundant supply of water could be counted on, but the reverse is the case. The project is one of those which have been frequently pressed on the attention of Government, by the Revenue Officers of the district and by the Revenue Board. Plans and estimates

for carrying it out were fully considered by Government in 1864, but were not approved as they did not appear to be based upon sound calculations of the cost of overcoming the natural difficulties of the country. They were consequently returned for revision, and this having lately been accomplished, the result is, I fear, that the project will have to be condemned. A project is also under investigation in Cuddapah District for improving the supply of two large tanks, but it is not yet matured.

18. As in Nellore and other districts, numerous improvements may be made to the existing tanks. Many of them have silted up to such an extent as materially to impair their efficiency; and the attention of the Officers of the department may be usefully occupied in restoring the capacity where possible by raising the embankments, when this can be advantageously done without submerging valuable land, or without incurring too great an outlay. No one project of this nature can merit the special attention of the Government of India; but a number of well devised improvements, which may individually appear insignificant, are what such districts as Bellary, Cuddapah, and Kurnool, and indeed most of the other districts in the Presidency as well, want; for it is by means of them that the existing sources of supply can be utilised to the full extent, while the introduction of a supply from extraneous sources is beyond the power of any works, however great.

19. Turning now to North Arcot and Madras, I have to explain that various improvements are in contemplation. The Government of India have already sanctioned the enlargement of the Red Hill and Cholaveram tanks, which derive their supply from the Cortilliar river, after it is joined by an important branch from the north-west; and also of the Chembrambaukum tank, which lies between the Cortilliar and the Palar river. These works, which are both in the vicinity of Madras, are now in progress, but the supply of the latter tank is dependent to some extent on that of other tanks, which cannot yet be considered to be of a satisfactory footing.

20. The Palar Anicut, and the channels leading from it, were designed with a view to improve the supply of nearly all the tanks—which are very numerous—situated between that river and the Cortilliar, as well as others to the north of the latter, but a very mistaken estimate was formed of the capabilities of the Palar, which, it was supposed, was in fresh for thirty-five days in the year on the average, whereas in reality, in some years, it does not come in fresh at all.

21. Very exaggerated views of the capabilities for sustaining extensive systems of irrigation, of the rivers on the Eastern Coast of this Presidency have been entertained by the public, and have been persistently urged on the notice of Government. Even the Commissioners appointed to enquire into the Public Works system in the Madras Presidency would have led the readers of their report* to the conclusion that the superiority of Tanjore over the districts adjacent to Madras was to be ascribed mainly only to one cause, viz., that capital to a vast amount had been invested in it, in bringing water to the fields, while they lost sight of the fact that Tanjore has extraordinary natural advantages in possessing a deltaic tract of country traversed by a number of arms of the Cauvery, and that, moreover, no amount of capital expended in attempting to bring water to the fields in North Arcot or Madras could place these districts on the same footing with Tanjore, unless the source from which that water was to be drawn could in the first instance have been made as abundant and as unfailing as the Cauvery. It now appears that the Palar works do not answer the expectations that were formed of them,

* Paragraph 284.

nor is it likely, when the project was drawn up, which was at a time when Officers had the greatest difficulty in obtaining money for any large works, that either they or the Government would have ventured to propose anything, had they foreseen that to secure a supply from the uncertain freshes of the Palar, a much higher scale of expenditure than had been customary on any other class of Irrigation works in the Presidency would prove to be necessary, and that the supply of that river was both so defective and so uncertain as it has proved to be. But on the other hand, it has now to be argued, that imperfect though the supply of the Palar is, it is the only one, besides local rains, which can be made available for filling a number of tanks, many of which are of considerable size and importance: that the remunerative effect of Irrigation works is not the only aspect under which they are to be regarded; and that if Government derive an exceptionally high rate of profit from one system of works like those in the Deltas, they ought to be prepared to make a corresponding sacrifice to bring up works less favorably situated to the highest standard of efficiency.

22. It must stand to reason, that it must be more difficult and expensive to draw a supply for a given area from a river which may be in fresh for ten days in the year, than it would be if the freshes lasted for sixty days or more, as is the case even with the Pennair at Nellore, and that, as there are tanks in the Pennair Delta, as well as in the country affected by the Palar, it must be a much more costly and less remunerative undertaking to distribute water from the latter than the former; and the disproportion of cost must be still greater if the Palar is compared with the Cauvery, or the Godavery, or Kistna Deltas where the aid of tanks is unnecessary. Besides which, the country through which a channel from the Palar has to be carried, instead of being alluvial and possessing a fall suitable for the conveyance of water, is undulating and irregular, and the soil in many places is hard and even rocky. These disadvantages have stood in the way of the Palar works having been taken up in a comprehensive manner.

23. The channels, so far as they are carried out, are, I believe, in the right direction, but they cannot be considered as in any way complete. They have to be greatly enlarged before the tanks at a distance from the head can be supplied by them, and numerous masonry works are required to regulate the fall. The expense must necessarily be great, as above explained; but unless the tanks are to be left to the natural supply from local drainage, it will have to be incurred. One thing should never be lost sight of, viz., that our native predecessors have constructed the tanks for us; and that the cost of improving the means of irrigation to the part of the Presidency under consideration must be immeasurably below what an entirely new system of works would have proved.

24. The above remarks on the Palar are applicable also to the Cheyaur, and in a somewhat less degree also to the Poiney: these, with the Palar, being the three streams from which such improvement of irrigation, as is compatible with the condition of a limited command of water, is expected to be derived. The Poiney, though only a branch of the Palar, is better situated, from the direction in which it takes its rise, to receive a good supply, and the anicut which was constructed on it some years ago, with the channels under it, have, in consequence, proved more useful than the similar works on the other two rivers, although they have not come up to what was expected of them. There is already an anicut and a system of channels from it on the Cheyaur, and two other projects connected with the

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same river have formed the subject of investigation during the past season. The existing project is not yet complete, and the surveys of the others have only been advanced to a stage which will enable a skilful Officer to use them as a basis for a general design of the works. I say skilful, for the alignment of channels through an undulating country, coupled with the necessity of providing for the supply of an enormous number of tanks of various sizes, must necessarily be an intricate and difficult operation. The object and scope of the projects connected with the Palar and Cheyaur rivers, which have been under investigation, are fully explained in the report by Colonel Boileau, Superintending Engineer, 4th Division. Two minor projects are also particularised by the Superintending Engineer, but I have not yet had the means of forming an opinion of their value. It is also designed to examine the north banks of the Cortilliar, and the Arnee or Nurnaveram river (drainage area 500 square miles) which runs a few miles further north, and which traverses a tract which is well provided with tanks. Indeed, the surface of nearly the whole of the North Arcot and Madras Districts is covered with a perfect net work of tanks. Some of these admit of enlargement, others may be connected with rivers, and have their supply more or less improved; and though the irrigation in both districts must always be attended with uncertainty, the Government should, I think, take it upon themselves to undertake that the supply of water available in *average years* at all events should be utilised, even if the works required to effect this object do not promise to be sufficiently remunerative to entitle them to a grant from the "Loan" Fund.

25. South Arcot is already well provided with the means of irrigation. A number of small but useful works have been carried out by the present Superintending Engineer, Colonel Foord, who has been connected with the district for the last twenty years, and two other projects, estimated to cost 54,800 and 11,000 Rupees respectively, have lately been submitted by him, and have received the sanction of Government. The smaller class of rivers which traverse this district are better supplied than the Palar, while the southern portion of the district is bounded by the Cauvery, and derives a supply from it by a channel leading from the lower anicut.

26. The Superintending Engineer is of opinion that there is no field left for works of the larger class, but that various improvements, of which he mentions several, may be superadded to the existing supply channels of tanks. The improvements which have either been carried out, or which are in contemplation, may all be said to be of the same character. Small channels have in times past been led off from the river to various tanks, and in freshes the water is turned into them, in some cases by means of permanent dams, in others by banks of sand and brushwood. The old channels are imperfect works, and the tanks furthest from the head get an insufficient supply. The revenue of course suffers in proportion. The new works almost invariably comprise the construction of a masonry weir or anicut across the supplying stream, and of head sluices for the regulation of the supply. The old channels are either abandoned altogether, or modified both as regards their sectional area and their levels, and distribution sluices are built for giving a proper share to the different tanks. It cannot be affirmed that the distribution is in all cases perfect, or that there is not room for further improvement in some of the works which have been executed under this Government, but, judging by results, the small projects which have been carried out in South

Arcot may be looked upon as pattern works of their class. It need not be supposed that the very high returns which are quoted from some of them are exaggerations. The storage room for the water had already been provided by the natives; the defects of the channels, as regards its supply and alignment, and the distribution of water had to be remedied before the people could get a proper supply for their fields: but these defects once removed by the judicious outlay of a moderate sum of money, the cultivation and revenue rise to the *maximum* of former years, or it may be beyond it, and compared with the average revenue, this rise may be enormous, and indeed appear incredible to any one who has not the opportunity of scrutinizing and verifying the returns. For example, it is hard to believe that an expenditure of between 11,000 and 12,000 Rupees on the Trivady Anicut, in South Arcot, yields an annual return of 30,000 Rupees. Of course, the more promising projects of this class are taken up in the first instance, a less paying series has then to be fallen back on, and, finally, we arrive at a stage when the improvements requi red may be of so expensive a character, that the results accomplished though they may be very beneficial to the country, may not be highly remunerative to Government.

27. In Salem, with the exception of tank improvements and the extension of irrigation from the Cauvery, no projects are likely to be brought forward. The Superintending Engineer mentions one which is now under investigation, and which is estimated to cost 59,600 Rupees. The formation of a large tank across the Pennair, near Kistnagherry, was suggested by the late Sub-Collector Mr. Thomas, and an Officer has lately been deputed to survey the site. Several other projects have been proposed for examination by the Revenue Officers.

28. The Cauvery forms the southern boundary of the Salem District and the northern boundary of Coimbatore. A project has been drawn up for the construction of an anicut across the river, at the distance of about twenty-eight miles from Erode, and for channels leading from the north and south flanks. The length of each in a direct line would be about twenty-five miles, though their actual course will be considerably more. An ancient rough stone anicut, a remarkable work of its kind, crosses the Cauvery at Nerinjepett* and its restoration had long been advocated by the Revenue and Engineer Officers of the Salem District, but prior to the year 1855, no detailed professional examination of the work, with a view to the preparation of a definite project in connection with it, had been made. In that year an estimate for restoring it and for a channel for the north bank was drawn up by Lieutenant (now Colonel) C. V. Wilkieson, but it was not sanctioned. The subject has been investigated afresh during the past season; and, with a view to gain a better command of the country, a site for a new anicut has been selected about four miles higher up the river than the old one. The ground to be traversed by the channels is very irregular, and is intersected by numerous drainages, which will necessitate the construction of a corresponding number of aqueducts and escapes. The project will thus be of an expensive character, but as a certain supply can be counted on from the Cauvery for the estimated acreage (about 20,000 acres, one crop only) without, it is believed, producing any injurious influence on the extensive irrigation in Tanjore, it is anticipated that the estimates will meet with favorable consideration. They are now nearly ready for submission.

* Poolumpett in the Trigonometrical map.

29. The Calingaroyen channel, which is fed by the Bowany river, and which runs with an extremely tortuous course fifty-five miles in length, but in a general

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direction nearly parallel to the Cauvery, and at a mean distance of about half a mile from the south bank, has also been engaging attention. The anicut across the river, and the channel itself, are of purely native formation, the head sluice and several masonry works constituting nearly all the improvements it has received under European management. The levels of the channel and the distribution of water are extremely defective, the water being led to the fields by means of cuts in the banks, to the number of about 2,000.

30. Large estimates were submitted for sluices in 1855 and other works, but funds were not available. This channel and others of a similar character under the Bowany, the aggregate revenue of which is about 2,00,000 Rupees, are being placed in the separate charge of an Officer, who after surveying them will prepare the necessary plans and estimates for the various improvements which are required to place the irrigation on a satisfactory footing.

31. There are numerous other channels in the Coimbatore District, chiefly under the Amravutty and Noyel rivers, with an assessment of about two lacs of Rupees. I cannot at present speak with any confidence as to what extent they are capable of improvement, but it can hardly be doubted that the present arrangements for the distribution of the water are defective, and that some of the channels which are now supplied by means of temporary dams, or Corumboos, would be benefited by the construction of masonry weirs across the supplying streams. On the Amravutty, twenty-two separate channels, of which six are supplied by the aid of temporary dams, and on the Noyel river there are twenty-four channels, all supplied by means of anicuts. Colonel Ludlow wrote as follows, in 1854, on the subject of these works :—"The Amravutty drains an area of upwards of 3,000 square miles,* including the southern slopes of the Dallee or Palaney range of hills and is partially affected by the south-west monsoon. For a considerable portion of the year, therefore, it has a fair supply, and at times a very large one, but at the latter end of the season this frequently fails, and the crops suffer much in consequence, and the necessity arises for large remissions in the worst cases."

* 3,500 square miles.

Average loss by remissions about 20,000 Rupees per annum.

"The area of drainage of the Noyel river (1,340 square miles) is much more circumscribed than that of the Amravutty, and owing to the confined extent and eastern aspect of Bolumputty valley, on which it has its source, the supply is anything but abundant." From Fuslies 1244 to 1260 (inclusive) the average annual assessment was Rupees 1,38,694, the settlement only 66,197, the per-centage of loss on the ayacut being fifty-two, or rather more than half.

32. Mr. W. Fraser, C. E., was occupied several years ago in drawing up projects for the formation of extensive reservoirs, on the branches of the Cauvery which drain the Neilgherry Hills, but the plans and estimates have not yet been submitted. I learn, however, that the designs for the most important of the proposed reservoirs will be sent in without further delay. A minor reservoir project was drawn up by Major Farewell, under the direction of the Superintending Engineer, 7th Division, Colonel Walker, and the prosecution of the work has been entrusted to Mr. McIvor, Superintendent of Government Chinchona Plantations, who has engaged to raise a bund to the height of 140 feet and to furnish the necessary appliances for disposing of the flood water for the sum of 25,000 Rupees.

G. O., No. 2,271, dated 16th July 1868.

33. In Tanjore and Trichinopoly the field for improvement is of a limited character. It has indeed been proposed to restore the old Ponnairy tank, which was formerly fed by the channels from the Coleroon and Vellaur, and it is very desirable that an investigation into the economical practicability of the undertaking should be carried out, when an Officer can be spared for the purpose; but the attention of the Officers of the Department, in these districts, will mainly have to be occupied in perfecting the existing system of irrigation under the Cauvery and Coleroon. In the Trichinopoly District there are several old channels, which may be considered as in a great measure independent of the great system under the Upper Anicut. They are of a similar character to the Calingaroyen channel, above described, and it is probable that the arrangements for the distribution of the water are capable of considerable improvement, and that it will be found advantageous to place an Officer in exclusive charge of them.

34. In Tanjore, the regulation of the Cauvery and its numerous important branches, or rather arms, is now engaging attention. The necessity of dividing the supply among the various channels, in proportion to the cultivation under them, has long been recognized by the Engineers of the district, though from the inability of the Government to provide the requisite funds, it is only recently that a project for carrying this important operation into effect has assumed a definite shape. As the Government are aware, Captain Mead has been engaged for a considerable time in carrying out the necessary preliminary surveys and investigations, which, owing to the enormous size of the rivers to be dealt with (the Cauvery for some distance from its head at the upper anicut being fully a mile wide), the total absence of reliable records of the cultivation under each river, and of levels showing the state of the channels at different periods, have necessarily been of a very laborious and intricate character. Captain Mead's first report has already been before Government, and the construction of regulating dams across the Cauvery at the heads of three large arms, the Codamoorty, the Arasalar, and the Veerasholen, and across the heads of the arms themselves, has been decided on. Plans and estimates may shortly be expected for the works which are still required for the control of the Cauvery itself. They are designed with the two-fold object of shutting off dangerously high floods from the Delta, and of effecting a fair apportionment of the ordinary supply between the Cauvery and the Vennaur, the cultivation under each of which is about 350,000 acres. It is not considered safe to discharge into the Coleroon beyond a limited supply of the surplus flood water, and as, moreover, a large quantity of water is required at times in the Delta, to make up for the deficiency below the ordinary standard at other times,—a contingency very liable to occur in consequence of the fluctuating character of the freshes,—the regulating works have to be designed on a scale far more extensive than any work of the kind that has been undertaken in this country.

35. The Superintending Engineer, Captain Oakes, does not anticipate that any great increase of cultivation, and, therefore, of revenue, will result from the improvement of the deltaic rivers, but he explains that the supply of the lands will be better regulated, and, therefore, more constant in seasons when the monsoon is not very favourable; and that the waters during floods being more fairly distributed, according to the capacity of dischage of the various rivers, will do less injury than they now do and that a large saving in temporary repairs and in closing breaches will in consequence be effected.

G. O., No. 1,783, dated 6th June 1866.

36. The regulation of the Cauvery and the larger streams in Tanjore once effected, the next step will be to improve the system of distributing the water to the smaller channels, or rather to institute a system, for at present there is none. It will be a task that will not be willingly taken up by many Officers in the Department, as independently of various engineering difficulties in their way arising from the variable character of the supply of water, they will meet with great opposition from the influential cultivators, who would not only present hundreds of petitions against the introduction of the new works, but would take more active measures to check them by bringing actions against the Superintending Engineer in the Law Courts. This is no imaginary evil as the Government are well aware. That some day or other it will be necessary to put a stop to it by legislation if any real improvement on the old native systems of irrigation is considered essential, I feel perfectly satisfied ; and, indeed, without legislation to support the Public Works Officers in Tanjore, it will be useless, as has been already brought to notice on several occasions, for them to attempt to introduce any real improvement in the present defective style of distributing the waters of the Cauvery.

37. In the Madura District, the existing supply of water is already fully utilised. There are numerous small channels from the Vigay and the minor streams in the district, but they are far from sufficient for the wants of the people. The importance of the Perryaur scheme, which was recently under the consideration of Government, and which would throw an abundant supply from an entirely new source into the most arid part of the district can hardly be over-estimated. The project has been investigated by Captain Payne and Captain Ryves, the latter Officer being the originator of the scheme, and a report has been submitted explaining the nature and object of the proposed works. Some delay occurred in following up the investigation in consequence of the demand for Officers in other directions, but two Officers have lately been appointed to open out roads, and to make the further preliminary investigations which are required, preparatory to the submission of the estimates for the approval of the Government of India. In briefly describing the nature of the project, I can only recapitulate what has been stated on other occasions. It is to turn the supply of the Perryaur, a river which drains an area of 250 square miles of hilly country within the influence of the south-west monsoon, over the edge of the ghauts, which overlook the plains of Madura. The bed of the river is about 165 feet lower than the lowest point in the ghaut, at the spot selected for the diversion, and at the distance of about four miles from it. It is proposed to raise the surface of the water to the height of about 150 feet above its lowest level, and to cut through the saddle to a maximum depth of forty feet. The site for the embankment is favorable as regards the formation of the ground, and the quality of the soil is also well suited for the construction of a water-tight embankment, but the locality has the reputation of being extremely unhealthy during the hot weather (15th February to 15th June,)—that is at the time of the year when the progress of the work would be least liable to interruption from floods,—and the ground is covered with dense jungle. The cutting through the saddle would be mainly in rock, and Captain Ryves has carefully considered the relative cost and difficulty of the embankment and cutting with various alternative heights and depths respectively, before coming to a conclusion that the preference should be given to those which provide for the formation of a reservoir 150 feet deep. Further enquiry may possibly lead to a modification of this arrangement, but not to any extent. The project is a noble one, and though there are formidable difficulties in the way of its execution, it is hoped that by perseverance and good manage-

ment it will eventually prove successful. The sanction of the Government of India to the large outlay it will involve cannot of course be expected, until the complete feasibility of the undertaking is established; and it is with that object in view that the two Officers above adverted to, have been deputed to open out roads in the vicinity of the proposed works, and by thus attracting labor on a small scale and accustoming the people to frequent a tract of country at present shunned by them, to allow of a judgment being formed as to how far the contemplated operations on a larger scale are practicable.

38. An ancient lake on the Pulney hills attracted the attention of His Excellency the Governor during his recent visit to Madura, and a rough survey by the Superintending Engineer shows that if it were restored it would be capable of holding a supply of water equal to the irrigation of 8,000 acres. The ground in the vicinity, which is 7,000 feet high above the sea, is described as being admirably adapted for a Hill station.

39. In Tinnevelly a project for utilising the surplus water of the Tambrapoorni river has been drawn up, and the estimates have lately been submitted for approval to the Government of India. This river, though of insignificant length, derives a plentiful supply from the south west monsoon, which breaks with full force on the ghauts, in which the river takes its rise. The irrigation under the river is very important. It is carried on by the aid of a succession of anicuts (seven in number) and channels, all of native workmanship. These old works have been maintained at a trifling cost to Government; and yield a revenue of about six lacs of Rupees. The project recently submitted provides for the irrigation of a strip of country to the north and south of the river, from the terminus of the existing channels to the sea. The northern channel, which ends at Tuticorin, will be twenty-six miles long, and the southern channel to Tritchendoor twenty-two miles. The area to be irrigated is estimated at 32,500 acres, and the returns Rupees 1,43,000 on the estimated outlay of about eight and half lacs of Rupees.

40. The improvement of the irrigation under the minor streams in Tinnevelly will also merit attention.

41. I have now in a manner described the condition and prospects of the irrigation in every district in the Presidency excepting Malabar and South Canara, which, in consequence of the abundant supply of water they receive from the south-west monsoon, do not require to be noticed. A few general remarks may be added with advantage.

42. The Government of India will perhaps be disappointed to learn that the improvements which are in contemplation in this Presidency are of a limited and even insignificant character, compared with the great projects which are coming before them from other provinces. But the fact is, that in no other part of India had so much been done for the development of the resources of the country by the old native rulers. The further South one goes, and the further the old Hindoo polity was removed from the disturbing influence of foreign conquest, the more complete and elaborate was the system of agriculture, and the irrigation works connected with it. The execution of such works appears to have been considered a religious duty by the people. Not only has almost every available source of supply, within their power of mastering, been utilised to a very great degree, but in many instances they even carried out the works far in advance of the supply. The vast system of tanks which cover the face of the country, and which represent an almost incalculable expenditure of labor, have very generally been constructed

not only to provide for the storage of the ordinary rain-fall, but also that of exceptionally favorable years. Not only, too, were all favorable sites for the construction of tanks eagerly sought for and turned to the best account, but unfavorable sites also, where success was only to be attained by the display of very considerable constructive skill, and by the most profuse outlay of money and labor, or at least of labor. The Natives thus constructed numerous tanks with embankments three or four miles long, and thirty to fifty feet high, and revetted on one or both sides with rough stone; with sluices for the distribution of water, and with escapes for the discharge of exceptional floods, some of them of great length and of massive construction. Their sluices are remarkably well adapted for the distribution of the water under a variable head, and are, moreover, eminently calculated to prevent the occurrence of accidents from the careless and imperfect management under which they must generally be placed. So anxious were the Natives to avail themselves to the utmost of all available sources of supply, that they constructed many tanks in situations where it was impossible that a proper supply of water should reach them; and it is now common to meet with works of the kind which at a later period have been purposely allowed to fall into decay. Other tanks have also been rendered useless by becoming silted up. The process though very generally a slow one, is nevertheless sure, and of course in cases in which the drainage water has, before reaching the tank, to pass over a tract of alluvial or other soil which will yield easily to the action of a current, the deterioration may be rapid. In such cases it is a mere question of time, for the soil which is thus distributed over the bed of a tank, to become more valuable for the cultivation of dry crops, than the ground outside, with a diminished supply, for the cultivation of rice. I lately saw a tank, near the head of the Pennair, a short distance to the north of Nundydroog, which had evidently been abandoned from this cause, the old bed having become raised about twenty feet above the level of the ground outside. Many instances might be given of tanks having been given up either from the same cause, or from the totally inadequate supply of water they received for the irrigation of the lands under them. Of course there are cases where tanks may have given way from neglect, or from their not being provided with proper means for the discharge of surplus water in heavy floods, but the cases in which they have purposely been allowed to go to ruin are, I believe, more numerous, although, from the works having been abandoned many years ago, the cause may not have been within the cognizance of the present generation. Projects for the restoration of old tanks must therefore be received with caution. It by no means follows that because an old tank bund may have been built on a large scale, and because comparatively little labor and expense are required to restore it, its restoration may be a judicious proceeding. In many cases it would certainly be the reverse.

43. The Natives also carried direct irrigation by means of river channels, or by channels and tanks combined, to a tolerably high degree of perfection. There is the Cauvery system in Tanjore, which is the completest thing of the kind in India, and the Tambrapoorny system in Tinnevelly, which though on a much smaller scale, exhibits, with regard to the anicuts across the river at the heads of the various channels, very considerable constructive skill. There are numerous works of a similar character on the Toongaboodra in Bellary, the Cauvery and its branches, and on nearly all the minor streams in the Presidency. With regard to the alignment of channels, the natives having only the means of judging of levels where they could see water actually running or standing, failed when they ventured to enter irregular

ground. They could not go far wrong as long as they kept parallel to a river, but if a ridge or a succession of ridges had to be cut through they got into difficulties. Consequently there are many old channels which have been abandoned, either because the difficulty of conveying the supply to the required point turned out to be more formidable than had been anticipated, or because the point of delivery may have been on an impracticably high level. On the whole, the native channels are an inferior class of work to their tanks. The distribution of water, though probably arranged originally on tolerably fair principles, is every where under the old channels of the most defective kind; but until definite proposals for rectifying existing abuses can be brought forward, it is useless to enlarge on this point.

44. It will be seen from the above remarks that the Natives had made great advances towards the attainment of a complete system of irrigation throughout this Presidency. But though many of their works exhibit considerable boldness of design, and no small degree of constructive excellence, they failed in mastering the largest class of rivers, where no foundation but sand was to be found for the construction of masonry dams. Thus it required the aid of British Engineers to construct anicuts across the Cauvery in Trichinopoly and Tanjore, and across various other rivers in the low county bordering on the eastern coast. Once they were finished, but two great works remained to be done. I refer to the construction of dams across the Godavery and Kistna at the heads of the deltas of those rivers, and to the opening out of a system of channels from them. The Natives had altogether failed to place the irrigation of the rich lands in the deltas on anything like a secure footing. They had indeed excavated a number of channels, and in the Kistna tanks had also been formed, but in consequence of the great variation in the surface level of the rivers, and the impossibility of conveying the water to the surface of the country during low stages of the supply, the cultivation was of the most precarious kind, and the districts would be suffering from famine when an abundant supply of water for the irrigation of the whole area was running uselessly into the sea. The anicuts at Dowlaishweram and Bezwada, with their subsidiary channels, have changed all this; but the irrigation of a district cannot be perfected in a single generation; and the completion of the works, with the introduction of improvements in the very imperfect mode of cultivation now prevailing in these districts is, beyond all comparison, the most important work that remains to be carried out in this Presidency.

45. Smaller works have been executed with good effect in Nellore, others are in contemplation there, and various projects are also under consideration for the improvement of irrigation in other parts of the Presidency, as I have explained in the body of this report; but they are all of an insignificant character compared with the works in the Godavery and Kistna Deltas. Nothing at all to be compared with them is likely to be brought forward. Every deltaic tract of country of considerable size is now taken up. There are only two rivers, the Cauvery and Toongaboodra, which derive a supply from the south-west monsoon, and which pass through any considerable extent of non-deltaic country within the limits of this Presidency. In consequence of that supply being the only one which is of so unfailing a character, as to constitute a source for any great extension of irrigation any large future projects must be limited to those rivers.* But owing to the hilly character of the country bordering on the Cauvery from its source to the eastern boundary of the Mysore terri-

* Unless we include the possible opening out of a second system of channels from the Godavery and Kistna, from Polarum and Chintapully—*vide supra* para 7 and 12.

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tory, and some distance beyond, no extensive works are to be looked for from it; and, as regards the Toongaboodra, the supply, which moreover is far less regular than that of the Godavery and Kistna at the heads of the Deltas, has been placed at the disposal of the Irrigation Company,—with what result the Government are aware.

46. The most important new projects under consideration at present are the Perryaur scheme in Madura, the Sungum project in Nellore, and the Rooskolia project in Ganjam. Any others which may be brought forward are likely to be of secondary importance. The improvements to existing works, which will from time to time be proposed, will however be very numerous. They will embrace the regulation of the Cauvery and its branches in Tanjore, the construction of head sluices to the Tambraporney channels and the rectification of defects of alignment and in the distribution of water from them as well as from various other old channels. Tanks also will in many cases admit of improvement. But with few exceptions such improvements, though important as a whole, and though they will involve a considerable outlay, will not individually merit the attention of the Government of India.

I have the honor to be,
Sir,
Your most obedient servant,

MADRAS.
11*th December* 1868.

[signature] Colonel, R. E.,
Chief Engineer for Irrigation.

P.W. 186[illegible] Sept.
8th 4920.
No. [illegible]

From
The Chief Engineer
for Irrigation

To
The Secretary
to Government P.W.D.

Dated 11th }
Despd. 18th } December /68
Recd. 18th }

No. 122.

Encls. - 30
Four [illegible]
[illegible]

Report on Survey Operations.

No. 247 - 27th Jany. /69

[illegible] [illegible] the [illegible] [illegible] [illegible]

No. 247

Ordered that these papers be forwarded to the Govt. of India

Fort St. George
27th Jany. /69

To the Chief Engr. for Irrigation,
" S. Engrs.,
" Revd. Depts.

Despd. 29/1/69.

C. 14th Decr./68 R. 24th Decr./68.

19/3/79

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Govt. of {1869} Madras

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To The Chief Engineer for Irrigation

Dated

Recd. Encl.

G. O. 27th Jany 1869, No. 247

Nos. 498–499

Irrigation projects Passing orders on the report of the Chief Engr. for Irrigation on the survey operations that have been carried out in connection with Irrigation Pro-